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Articles relating to the different branches of municipal engineering are desired. Stamps should accompany manuscripts for return postage if unavailable.

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The columns of this publication are open to the discussion of all subjects relating to paving, sewerage, water-works, street-lighting, and the physical improvement of cities. Practical information as to the merits of materials used in such work and new methods, with photographs and drawings, which may be used for illustration, are especially desired. We are glad to get brief notes as to proposed improvements and the letting of large contracts.

City engineers are requested to send us as early as possible copies of their annual reports, which will be given proper notice.

Articles relating to methods of road making and maintenance are invited.

IMITATIONS OF ASPHALT.

By Louis H. Gibson, Our Special Representative in Europe.

IN considering this subject, it is well to make a distinction between laudable imitations and counterfeits of the real thing. It is certainly not discreditable to undertake to imitate a natural product which is expensive. Asphalt is an expensive material. It is laudable to undertake to imitate it if, at the same time, the real character and history of the material be clearly and unmistakably made known. The fact that it is an imitation is in no wise against it if it is successful. The engineers and the general public will be quick enough to recognize merit in an imitation of asphalt or any other material. However, no wrong can be greater than to put forth a material of uncertain character in a way to reflect to the disadvantage and loss, not only of those who have invested money in the development of the original product, but also to swindle the public.

Imitation by cheap methods for profit, without regard to the harm that may be done to the manufacturers of honest material or the loss to the general public, is worse than highway robbery. It is the worst form of stealing. It steals not only the money from the pockets of the public, but affects the reputation and business of those who, with an honest purpose, have undertaken to produce a material of high quality. The manufacturers of natural asphalt have been greatly injured in this way. The public does not make fine distinctions. They see a product put on a street; it is black; it smells bituminous when it is put down, and the carriages drive over it. It is cheap; in time it fails; they say: "Let us have no more asphalt." Explanations of those manufacturing an honest material have nothing like the effect of the failure of the dishonest product.

The laudable imitation is the one that claims to be what it is. If it be successful, it will sail as well under its true colors of acknowledged imitation as under those of an original product. Asphalt has been imitated successfully for places where it was not subject to wear, for fillings between sills in basements, coverings of sewers, on the exterior surface of sewers, and the coverings of other underground tunnels. However, in places where it has been subjected to the danger of fracture in travel or sudden variations of temperature or other great strain, it has never proved successful when imitated.

Asphalt has been made in the laboratory which looks like the natural asphalt. It is done by taking carbonate of lime and solutions of bitumen and sulphate of carbon and impregnating the lime therewith and afterwards evaporating the sulphur. While it has the appearance of asphalt it does not fall into powder at a temperature of from 80 to 100 degrees centigrade, and is distinctly a laboratory product. It is expensive and not practicable commercially. It is only the crude, common, vicious counterfeits, those which crack under pressure or give under the wheel, or generally pulverize and disintegrate, which are inexpensive enough in their manufacture to admit of their use.

A noted French writer on asphalt gives a very picturesque account of the application and history of American asphalt counterfeit which was put down in Paris in 1886. He says:

"In the month of September, 1886, an American asked permission from the city of Paris to lay on Rue de Rivoli, at some point the most in use, a specimen of bituminous pavement of his own invention, destined, because of its cheapness and superior resistance, to supplant all other pavements then in use in Europe. Although the city felt the necessity of prudence in the expenditures, it could not deny a request which presented perfect financial security, especially as the inventor affirmed and proved, by certificates from prominent Americans, that he had laid more than a million square metres in the cities of the United States and that results had been marvelous.

"Accordingly a surface of seven thousand metres was given him between the Louvre and Rue du Temple. For three months, from the first of September to the first of December, the passage of vehicles was interrupted. Negroes sent from America executed the work with a slowness which argued well. A small steam

roller, illuminated like an image of Epinal 'promenaded' upon the bituminous surface in a manner to compress with considerable energy. The street was opened upon the fifth of December. The ninth of December, that is, three days after, unexpected holes manifested themselves along the street car rails. These constantly increased. At first they were filled with bitumen, then with pebbles; but neither availed. The entire asphalt surface boiled under the wheels of the vehicles, and in June of 1887, the inventor received an order to remove, as quickly as possible, what remained of this material."

The writer continuing, says: "It is to be hoped that this is the last misfortune which compressed asphalt will experience in Paris, We have nothing to criticise in these experiments which are made at the risk of inventors, excepting that they confuse the public mind and throw discredit on true asphalt. The public does not discern the difference between the real article and the counterfeit, and lay at the door of the former the faults of the latter. To the present time this, the real asphalt, has done little else than gather a crop of such unhappy heritages."

An analysis of this pavement showed it to be made up of various bituminous materials, such as crude trinidad, "goudron de schists," and other coarse products to the extent of sixteen per cent., and fine sand, white limestone and clay to the extent of eighty-four per cent. The company putting down this product was the Barber Asphalt Company.

It is well to enforce by repetition the statement that a purely factitious asphalt does not exist. Counterfeited raw asphalt is too costly to be practical.

Mastic asphalt is more easily counterfeited and deceit more readily carried out, though results are uniformly bad. In this connection, it is well to state what was made clear in a detailed way in a previous article that mastic asphalt, which is more largely used for sidewalks than anything else, is a mixture of natural bitumen-powdered asphalt and gravel.

The counterfeit consists in the use of other material instead of the powdered asphalt; mixtures of lime rock, powdered terra cotta and gas tar, and at times crude trinidad. While this material is most excellent for subterranean applications and, as far as appearances go, will deceive even those of some experience, it is utterly unfit for use on sidewalks or other exposed places. However, its appearance so closely counterfeiting the original material stands as a temptation to its use. It is particularly dangerous, because even a reasonably bad imitation will last as long as one year, and often two or three, while those still more carefully prepared last as long as five and six years. The true mastic asphalt, however, will last for twenty years, under the most severe wear which may come to it on a sidewalk. Considering that the cost does not often represent more than twenty or thirty per cent. of difference, which is therefore out of all proportion with its durability, the crime of its introduction is readily apparent.

The following is a form for analysis of bitumen given by the Engineer in Chief and Director of Laboratory of the School of Civil Engineering of Paris, Monsieur Durand-Claye: "The material for analysis is digested in carbonate of sulphur and then filtered. The liquor is evaporated and heated until it is found by cooling that the product is hard and brittle like coal tar. About one decigramme of the dry substance is pulverized in a mortar. This powder is what is subsequently operated upon. It is placed in a tube and five centigrammes of Nordhausen's sulphuric acid added. After this the tube is closed with a cork and left to digest during twenty-four hours. The tube is then placed so as to be surrounded with cold water and ten cubic centimeters of water added, it being done slowly on account of the heat developed during the process. The tube is then shaken gently and several times at intervals of about one-quarter of an hour. Next it is filtered through a funnel in a vial of 100 to 150 grammes capacity. When all has passed through, which process frequently requires a long time, one washes into the mixture 100 cubic centimeters of cold water. The liquid obtained is colorless, or nearly so, when one has operated on natural bitumen. If gas tar has been used the color is dark brown or nearly black, as one looks through the water. The intermediate colorings between the dark brown and the light watery color of the true bitumen indicates the varying impurities of the materials handled.

"The value of this analysis is dependent upon the accuracy of the methods employed, always holding exactly to the same formula and comparing with solutions obtained from materials of known composition. Equal quantities should be placed in vials of the same size and viewed by the light of day."

Paris, Oct. 30, 1891.

THE GOSPEL OF GOOD ROADS.

By Isaac B. Potter.

TO THE AMERICAN FARMER: In these days, when the voice of your complaint is loud in the land, and a thousand partisans are proclaiming a thousand theories to account for the "decline of agriculture," I will try to write you a letter, in which, I believe, I can make it appear that the greatest remedy for the cure of unprofitable farming lies in your own hands.

It is a thankless, unpopular, and, in some respects, a discouraging thing to preach reform, and the man who undertakes it for your benefit is entitled to your everlasting regard. I am going to make that claim upon you, and you will be more ready to square the account when you know that I am opposed to high taxes, and to the placing of undue burdens upon the farmer, and that I am only trying to show a way for the enrichment of your slender purse and the betterment of your condition.

The man who lives on a farm should be happier for every asso-

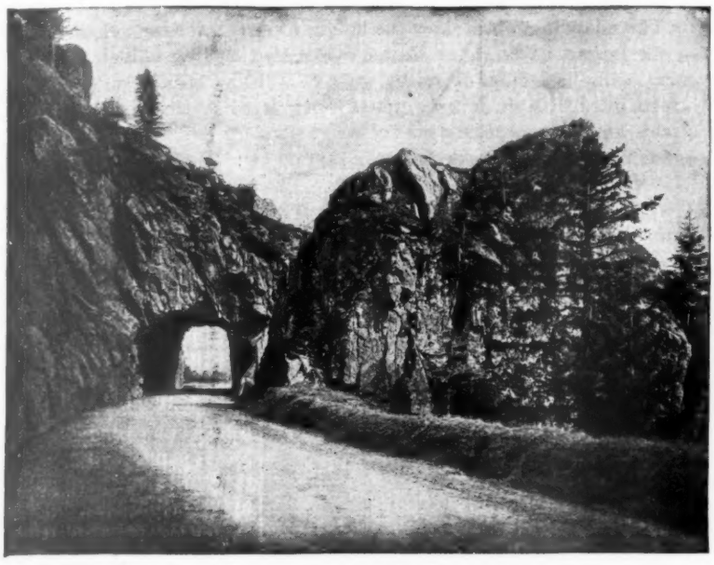
A FAMILIAR SCENE.

ciation of farm life. It is a splendsd thing to breathe pure air, drink pure water and have a hundred acres of elbow-room. Another thing, every farming community is a community of homes. You have something to be proud of in that. It broadens your manhood and makes you know you have a sacred spot to love and defend. It makes you a good citizen and a tender husband and father. I wouldn't give much for the patriotism of a man whose only interest in the nation can be packed in a carpet bag. He is not the man for the times when his country is in peril, and when the air trembles with the noise of battle you will find the great bulwark of defense to be made up of volunteers from the farms and firesides. Most great men have been born in the country, and no child of genius ever yet thrived in a boarding-house. The great and successful government is always a government of homes.

And I want to acknowledge the importance and grandeur of your vocation. It is the prime source of all national wealth, and

under proper conditions, it should make you the happiest and most independent of mortals. By the fruits of your toil humanity is sustained, and to reward your industry the coffers of the world are open.

But these are the incidents of your calling. Personally you inherit the common foibles of the race, and you are not aloof from the errors nor exempt from the misfortunes which beset us all. In all kindness let me remind you that in other years you and your good neighbors have opposed many great improvements which were intended for our common benefit, and which the lapse of time has placed in the highest niches of human advancement. You do not forget that when the first railroads were projected you appeared before the legislature of your state and opposed the granting of franchises to all such iniquitous schemes. You said that the locomotives would burn your crops and set fire to the wool on the backs of your sheep; that the gases from the smoke stack would



A COUNTRY ROAD IN FRANCE.

poison your family and your farm stock, and that travel in a railroad car at the frightful speed of twenty miles an hour would be fatal to many passengers and dangerous to all. You opposed the telegraph and ridiculed the mowing machine. You took the sewing machine on sufferance and regarded the patent thresher with a suspicious eye; and I might almost say there is no great invention of commercial or agricultural value which was cheered at its birth by the warmth of your approval.

It is best that I should remind you of these things. I do it without malice, for I am somewhat of a farmer myself, and in this most friendly communication it is best that we begin with the frank understanding on all sides that in spite of your great intelligence, events have proven that, like the rest of mankind, you are likely to err. We don't always recognize a good thing at first sight.

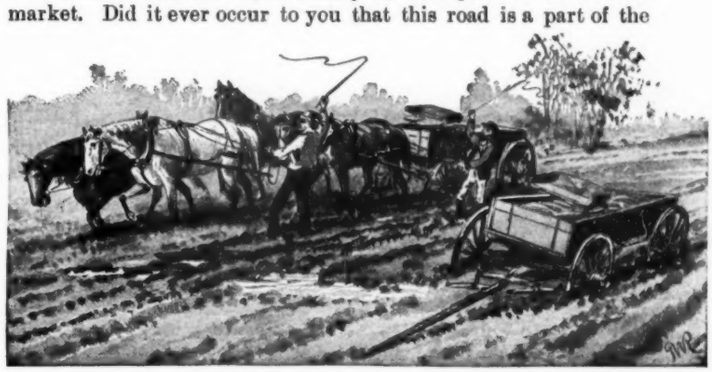
You have changed your opinions about many things because you did not at first understand their value. Observation, argument and experience have helped you out of many an error; and I am sure you will pardon me if I suggest that you have never yet earned the value of a good road; for upon this subject you have had neither observation nor experience, and without these argument is certain to go astray. Let me remind you by one or two illustrations taken from your personal history.

The scythe and the flail are no longer the best tools of your trade, and you long since ceased to shoot crows with the old flintlock. A few years ago one of your venturesome neighbors went to the state fair and brought home a patent reaper. A little later an enterprising drummer sold him a thresher and a fanning mill. He was a brainy neighbor, with plenty of nerve and confidence in his own judgment, and you profited by his experience. You looked over the fence while he was at work and became satisfied that the old way of doing things involved an extravagant waste of time and labor; and you soon found that the money spent for farming machinery was well invested. Then they ran a line of railroad up through your county, and after awhile you discovered that it was cheaper and vastly quicker to ride on the cars than to go long journeys by the common road; and you have been on tolerably good terms with that railroad ever since.

Each of these splendid improvements has filled a want. Proving first its usefulness and then its necessity, it has found a market. You can not half succeed without it. Did you ever think how it was that all these labor-saving things were first brought to your attention? They were not born in a public institution nor invented by a public officer—not one of them; they were not put in use by the vote of a town meeting nor by proclamation of the governor; they are no part of the public business, and in bestowing their benefits they have been careful to avoid the sluggish turn of the public mill. It all came about in quite a different way. Do you remember how you first came to buy a mower? A wide-awake Yankee told you that he had a machine for cutting grass by horsepower; that this machine would do better and cleaner work than your scythe, and that, too, at the rate of an acre an hour. You said, "Nonsense." He took his mower down into your meadow, and in a good-natured way proved to you that you could save money in buying that machine; that you had been paying too much for hired help and boarding too many extra hands in harvest time. You bought that mower, and though you paid what seemed a round figure, you now know that it has paid for itself many times over.

And so you see at the outset, that the mower was rather forced upon you, as were the horse-rake and the reaper and all the rest of the splendid things in the category of farming machinery. You have taxed yourself to pay for these improvements. There is no philanthropy in trade, and you have paid cost and profit to the manufacturer till he has grown rich in the business; but on the other side of the account it appears that the millions of money spent by the farmers of the United States for improved machines have been repaid to them a hundred fold by the saving of time, labor and money which the old methods would have entailed. You have shared benefits and divided profits with the manufacturer, and your money has gone unbewailed to pay for a splendid thing. You tax has turned out to be an investment, and in the year 1880 you had over four hundred millions of dollars invested in farm implements and machinery.

But I began with the intention of writing to you about roads—the common road that leads from your door-yard to the nearest market. Did it ever occur to you that this road is a part of the



"HOW CAM'ST THOU IN THIS PICKLE?"

machinery of agriculture? That your farm wagon is a machine, pure and simple, and that the road bears the same relation to your wagon that the steel rail bears to the railway car? It will do you no harm to think of this a moment, and to remember that every great improvement is the child of thought. The head will ever guide the hand, and every splendid thing you ever did was born and bred in your brain. When the people think the nation moves; and a government of sluggards is next door to a government of slaves.

If I could be sure that your strong sense would be put to work

in the settling of this question of better roads, my letter to you might stop right here; but I know that your thoughts are every day directed in the channel where flows the tide of your personal affairs, and in these times of fierce competition you have little to give to the settlement of public questions. You have taken things as you have found them, and long use of dirt roads has almost persuaded you that they are good enough. You are a victim of the ensnaring wiles of custom. "Custom," says Montaigne, "is a violent and treacherous school-mistress. She, by little and little, slyly and unperceived, slips in the foot of her authority; but having, by this gentle and humble beginning, with the aid of time, fixed and established it, she then unmasks a furious and tyrannic countenance, against which we have no more the courage nor the power so much as to lift our eyes."

I have no ax to grind and have nothing to sell you; but I want you, as an old friend, to give to this question of good roads the same thought that worked your brain when you bought the mower, for I am going to say some surprising things to you about the country roads, and we shall get on immensely better if we agree about the facts. And I am going to try to steer clear of theory for the road question is far and away the most important one to the American farmer to-day, and when we talk about roads it is best to bear in mind that one fact is worth a gross of guesses, and to apply that scriptural rule, which is no less good in material than in moral things: "Prove all things; hold fast that which is good."

STATISTICS REGARDING CITY STREETS.

THE census bulletin on the social statistics of cities shows for fifty of the largest cities in the United States, from which complete returns could be obtained, the length of streets, with distinction of those paved from those graded and curbed only, the average width of streets, the percentage of length of streets paved, the width of sidewalks to street, the miles of streets having shade trees, the length and width of grassed places, miles of streets to each square mile of area, percentage of street area to city area, number of population per mile of streets, and the average yearly cost per head of population for construction and repairs of streets and street cleaning. The given width of streets is that between building lines, and the grassed places are either from the houses to the sidewalks, in the sidewalks, or in the center of the streets. Open squares and parks are not included under this head.

The percentage of total area of cities which is occupied by streets varies greatly. Thus, in Taunton it is 3 2, in Worcester, 5.4; in Boston, 8 8, and in Fall River, 9.2, while in Denver it is 73.9; in Indianapolis, 56.4; in Washington, 43 5, and in Baltimore, 34.4.

All the streets in Boston, Worcester and Holyoke are paved, while in Denver none are paved, and in Minneapolis but 3.1 and in St. Paul, 4.1, and in Dallas, 4.7 per cent. are paved. The average yearly cost of construction and repairs per head of population in cities having over 100,000 inhabitants is $1.54, and in twenty-seven cities of less than 100,000 inhabitants it is $2.04. The amount per head of population annually expended in street cleaning varies from five cents in Buffalo to eight cents in Chicago, to seventy-one cents in New York and sixty-two cents in Cincinnati. There is probably no definite relation between the cost per head of street cleaning as shown by these figures and the actual condition of the streets as to cleanliness. In many cities the cost of street cleaning is included in the account for construction and repairs.

The following table shows for 225 cities, grouped by geographical divisions, the average proportion of paved streets and amounts paid annually for the last ten years for work upon streets:

Geographical Divisions.	Number of Cities.	Total Population.	Length of Streets (miles). Total.	Paved.	Per cent. of Streets Paved.	Average Annual Cost of Construction and Repair.	Cost Street Work to each head of Population.
Total	225	14,663,963	35,723	10,885	30 47	$25,256,551	$1 72
North Atlantic	96	7,470,324	9,787	5,261	53.75	8,459,554	1 13
South Atlantic	16	1,080,586	1,997	857	42.91	11,390,779	1 29
North Central	81	4,618,688	17,073	3,563	20 87	11,901,291	2 58
South Central	18	819,018	3,062	704	22.99	1,224 043	1 49
Western	14	675,347	3, 804	500	13.14	2,280,884	3 38

The low percentage of paved to unpaved streets and the increased cost of street work to each head of population in the cities of the North Central and Western groups, are largely due to the fact that municipal improvements in many of these cities were commenced or mainly carried on during the past decade.

The following table presents the same statistics for cities having from 10,000 to 100,000 inhabitants, divided into groups according to size:

Population Groups.	Number of Cities.	Total Population.	Length of Streets (miles). Total.	Paved.	Per cent. of Streets Paved.	Average Annual Cost of Construction and Repair.	Cost to each head of Population
Total	193	5,093,687	22,001	5,560	25.27	$8,721,493	$1 71
From 10,000 to 14,999	75	892,099	5,362	1,271	23.70	1,563,936	1 75
From 15,000 to 24,999	55	1,098,719	6,633	1,617	24.38	1,888,723	1 67
From 25,000 to 49,999	45	1,554,839	5,928	1,520	25 64	3,128,536	2 01
From 50,000 to 99,999	23	1,548,030	4,078	1,152	28.25	2,190,298	1 41

The following tables show the length of streets for each of fifty of the largest cities of the United States, that made complete returns, with distinction of paving, average width of streets, miles of streets lined with shade trees, amount of grassed surface bordering streets, and average annual cost of street work for the last ten years or for the time such work has been carried on:

TABLE I.

CITIES.	STREETS. Length in miles. Total.	Paved.	Graded and curbed only.	Average width. (Feet.)	Per cent. of length paved.	Average width of sidewalks. (a) (Feet.)	Miles of streets lined with shade trees.	GRASSED PLACES. Length. (Miles.)	Average width. (Feet.)
New York, N Y	575	358	45	60	62.26	15	.....	.....	.....
Chicago, Ill	2048	629	1419	66	30.71	17	1200	1300	7
Philadelphia, Pa	1151	750	50	50	65.16	13	.....	.....	.....
Brooklyn, N Y	653	375	3	70	57.43	18	183	300	5
Saint Louis, Mo	1061	422	40	60	39.77	12	50	30	10
Boston, Mass	408	408	.....	40	100.00	7	.....	.....	.....
Baltimore, Md	780	459	100	66	58.85	13	100	.....	.....
San Francisco, Cal	342	92	190	69	26.90	14	.....	.....	.....
Cincinnati, Ohio	486	254	.....	50	52.26	10	.....	.....	.....
Cleveland, Ohio	462	69	129	66	14.94	22	.....	.....	.....
Buffalo, N Y	372	194	.....	58	52.15	23	200	350	10
New Orleans, La	625	89	261	60	14.24	12	25	30	30
Detroit, Mich	400	147	.....	57	36.75	29	.....	360	15
Milwaukee, Wis	419	72	6	75	17.18	15	349	.....	.....
Washington, D. C	235	163	.....	100	69.36	17	230	230	20
Newark, N J	186	48	138	60	25.81	10	.....	.....	.....
Minneapolis, Minn	800	25	4	80	3 13	27	.....	400	4
Omaha, Neb	508	52	41	66	10.24	13	.....	10	6
Rochester, N Y	240	72	72	50	30.00	(b)	.....	.....	.....
Saint Paul, Minn	970	40	325	60	4.12	10	50	28	36
Denver, Col	756	.....	756	80	.....	11	.....	.....	.....
Indianapolis, Ind	400	234	16	75	58.50	13	234	234	6
Worcester, Mass	195	195	.....	50	100.00	17	150	.....	.....
Toledo, Ohio	438	60	220	66	13.70	13	70	25	12
New Haven, Conn	140	32	.....	60	22.86	12	.....	.....	.....
Lowell, Mass	105	19	1	50	18.10	14	79	.....	.....
Nashville, Tenn	251	147	.....	50	58.57	17	50	150	20
Fall River, Mass	106	2	79	50	1.89	8	.....	.....	.....
Cambridge, Mass	79	23	.....	50	29.11	8	.....	.....	.....
Camden, N. J	100	31	20	60	31.00	15	50	1	20
Trenton, N, J	100	7	50	60	7.00	12	75	5	5
Lynn, Mass	125	82	30	50	65.60	8	20	.....	.....
Hartford, Conn	130	80	50	70	61.54	18	91	91	15
Evansville, Ind	136	33	52	70	24.26	23	6	1	12
Los Angeles, Cal	800	83	76	60	10.38	10	.....	80	30
Lawrence, Mass	82	75	.....	50	91.46	8	.....	.....	.....
Hoboken, N. J	30	17	3	58	56.67	15	9	.....	.....
Dallas, Tex	529	25	66	60	4.73	12	15	15	2
Sioux City, Iowa	340	14	75	80	4.12	13	45	90	8
Portland, Me	56	9	43	50	16.07	8	49	3	10
Holyoke, Mass	50	50	.....	60	100.00	10	.....	12	4
Binghamton, N, Y	80	4	70	50	5.00	8	50	50	4
Duluth, Minn	224	35	20	66	15.63	17	.....	23	10
Elmira, N. Y	90	43	5	55	47.78	14	45	85	6
Davenport, Iowa	140	26	79	70	18.57	12	30	5	6
Canton, Ohio	150	5	115	60	3.33	12	150	16	8
Taunton, Mass	200	170	20	40	85 00	6	.....	.....	.....
Lacrosse, Wis	125	15	110	66	12.00	17	20	20	7
Newport, Ky	30	27	3	66	90.00	26	25	2	.....
Rockford, Ill	120	31	50	66	25.83	10	60	98	5

a Includes both sides. b No records.

TABLE II.

CITIES.	Miles of streets to each square mile of area.	Per cent. of street area to city area.	Number of population to each mile of streets.	Average yearly cost of construction and repairs.	Average yearly cost of street cleaning.	AVERAGE COST PER HEAD OF POPULATION	
						Construction and repairs of streets.	Street cleaning.
New York, N. Y	14.30	16.25	2,635.31	$1.024,161	$1,075,200	$0.68	$0.71
Chicago, Ill	12.75	15.94	537.03	3,500,000	88,128	3.18	0.08
Philadelphia, Pa	8 90	8.42	909.61	637,550	283,979	0.61	0.27
Brooklyn, N. Y	24.68	32.72	1,234.83	393,945	165,165	0.49	0.20
Saint Louis, Mo	17.29	19.65	425.80	837,304	126,804	1.85	0.28
Boston, Mass	11.56	8 76	1,099.21	825,000	136,673	1.84	0.30
Baltimore, Md	27.48	34.36	556.97	120,000	110,000	0 28	0.25
San Francisco, Cal	22.12	28.91	874.26	958,743	58,437	3.21	0.20
Cincinnati, Ohio	19.44	18.41	610 92	855,000	185,000	2.88	0.62
Cleveland, Ohio	18.57	23.21	565.70	350,550	49,807	1.34	0.19
Buffalo, N. Y	9.53	10.47	687.27	573,244	13,000	2 24	0.05
New Orleans, La	16 85	19.15	387.26	a35,000	25.000	0.14	0.10
Detroit, Mich	19.43	20.97	514.69	334,617	33,861	1.63	0.16
Milwaukee, Wis	24.65	35.01	487.99	468,077	(b)	2 29	.....
Washington, D. C	22.95	43.46	863.74	507,320	62,450	2.50	0.31
Newark, N. J	10.47	11.89	977.58	a20,000	30,000	0.11	0.16
Minneapolis, Minn	15.48	23.46	205 92	200,000	(b)	1.21	.....
Omaha, Neb	20.73	25.92	276 48	583,565	22.000	4.15	0.16
Rochester, N. Y	15.38	14.57	557.90	141,803	20,611	1.06	0.15
Saint Paul, Minn	18.86	21.44	137.27	757,902	37,584	5.69	0.28
Denver, Col	48.81	73.95	141.15	48,250	(b)	0.45	.....
Indianapolis, Ind	39.72	56.42	263.59	275,000	50,000	2.61	0.47
Worcester, Mass	5.73	5.43	434.13	140,011	7,000	1.65	0.08
Toledo, Ohio	22.21	27.76	185.92	327,902	8,137	4 03	0 10
New Haven, Conn	18.52	21.04	580.70	136,416	4,500	1.68	0.06
Lowell, Mass	9.42	8.92	739.96	98,712	(b)	1.27	.....
Nashville, Tenn	29.74	28.16	303.46	130,000	(b)	1.71	.....
Fall River, Mass	9.68	9.17	701.87	66,500	(b)	0 89	.....
Cambridge, Mass	13.55	12.83	886.43	45 000	25,000	0.64	0.36
Camden, N. J	23 04	26.18	583.13	22,000	11,000	0.38	0 19
Trenton, N. J	25.32	28.77	574.58	10,000	1,800	0.17	0.03
Lynn, Mass	11.75	11.13	445.82	40,000	10,000	0.72	0.18
Hartford, Conn	8.77	11.76	409.46	46,783	5,633	0.88	0.11
Evansville, Ind	30.77	40.79	373.21	33,713	7,689	0.66	0.15
Los Angeles, Cal	28.99	32.94	62.99	.....	(c)	.....	.....
Lawrence, Mass	12.29	11.64	544.56	33,209	3,000	0.74	0.07
Hoboken, N. J	20.41	22.42	1,454.93	20,000	2,000	0.46	0 05
Dallas, Texas	68.88	78.27	71.96	18,000	(b)	0 47	.....
Sioux City, Iowa	11.00	16.67	111.19	753,157	6,000	20.05	0.16
Portland, Me	22.31	21.13	650.45	58,000	(b)	1.59	.....
Holyoke, Mass	12.56	14.28	712.74	18,000	(b)	0.51	.....
Binghamton, N. Y	7.97	7.55	437.56	15,000	1,000	0.43	0.03
Duluth, Minn	69.35	86.69	147.83	496,642	5,000	15.00	0.15
Elmira, N. Y	20.22	21.07	330.09	12,000	2,000	0.40	0.07
Davenport, Ia	31.75	42 09	191.94	30,000	5,000	1.12	0 19
Canton, Ohio	22.06	25.07	174.59	32,000	(b)	1.22	.....
Taunton, Mass	4.22	3 20	127.24	36,000	(b)	1.41	.....
Lacrosse, Wis	15.26	19.08	200.72	20,378	(b)	0.81	.....
Newport, Ky	25.00	31.25	830.60	15,000	4,000	0 60	0.16
Rockford, Ill	18.84	23.55	196.53	12,000	2,000	0.51	0.08

a Repairs only. *b* Included in construction and repairs. *c* Not obtainable.

THE HIGHWAYS OF EUROPE.

A REPORT has been issued by the state department at Washington on the subject of "European Highways," which treats of all the highways, streets and roads in the world outside of the United States. Consuls general, consuls, vice-consuls and consular agents have collected all the information possible regarding the highways of the countries to which they have been sent. The result is a volume of seven hundred pages, full of information. One will not read far in this book to learn that good roads can be built in the western states which have deep soils—roads which will be as good in winter as in summer; with which a community will never be mud-bound. But these roads will cost money—a good deal of it. To secure them it will be necessary to abolish the old system of "working out highway taxes," which has come to mean spending several days with men and teams actually making the roads, temporarily, at least, worse than they were before the effort was expended on them. A large part of the report is devoted to the pavements of cities, which may afford hints to those who are experimenting on the surest and most effective means of testing how much spoliation the people of a city can stand for alleged street improvement and yet maintain a cheerful demeanor. But here is one requirement for a good street or highway, whether we seek instruction in England, France, Germany, Africa or Canada, and that is drainage. No amount of money can make a good street or highway whose bed is water-soaked or whose sides are ponds of water. All good roads have a drain in the middle of them to take up the water, which is let out at intervals and carried into the adjoining country and not permitted to make canals of the ditches. It seems, from reading this report, that the engineers in charge of the construction of such roads for years have had very clear ideas of the difference between hydrostatics and hydraulics, and are positively informed that water will not run up an inclined plane, and that where the country beside the highway is higher than the road-bed the latter is very certain to be overflowed in seasons of copious water-supply. Reference is made to this fact because those who have had occasion to notice street engineering in some cities must be forced to the conclusion that those who have performed it, or think they have performed it, are not familiar with the elementary principles of drainage and the inaptitude of water to run up hill or get out of basins except by saturation.

The Romans to-day would be considered a sort of back-number in civilization, but they did know how to make roads, and for all time. Some of them, made before the Christian era, are yet doing service. The Appian Way was, undoubtedly, the finest road ever made, and if the old Romans had possessed "rigs" of similar excellence, they must have made some fast quarters. But the Roman roads were built when human existence and human toil was of no value—when men were too cheap to be really useful Such roads can not be duplicated. But, it may be added, the Roman road-builders knew the importance of drainage.

More space is given to a description of English roads than to others, not because they are superior, but because the information was more easily obtainable. The British people have splendid roads, but they are of comparatively modern origin. One has not to go back two hundred years to find that England had worse roads, if possible, than has any of the western states. The man who revolutionized road-building in England was not born until 1756—a little before the time when England and America fell out. At that time the English highways were built after the Roman models, but they were so expensive that comparatively little progress could be made. Telford's system was used to some extent, but Macadam effected a revolution. Instead of roads of four and one-half feet in thickness, he built them at most not over ten inches, and for a deep trench filled with rocks on a concrete foundation, with a surfacing of gravel or fine stone, he substituted stone broken small, which was laid on the level natural, but drained surface. Imperviousness to water, rather than thickness, was the principle he discovered. He found that stone broken small, when packed, came in time to closely resemble a stone wall. Upon his general principles every highway of any account in Europe and America is built. Napoleon, the genius who saw everything, appreciated the value of Macadam's ideas, and upon them constructed the grand system of highways in France which his alleged nephew completed when he was emperor. Germany, Switzerland, Belgium, Holland, indeed nearly all continental Europe, have highways which have been successfully constructed upon the fundamental principles of Macadam. There have been modifications, depending upon location and materials, but all successful road-making of to-day is much as Macadam left it nearly one hundred years ago.

All the highways of England are now free, and have been for thirteen years. Every parish meets the expense of maintenance by local taxation, and the roads are well cared for. After construction, maintenance is most important and expensive. Exclusive of the district about London, England and Wales pay $19,500,000 to keep their highways in repair. In Ireland, where everything is poverty stricken, the main highways are kept up at a cost of $110 a mile annually. England has secured her excellent roads in no small degree by the labor of criminals. It appears from the reports, too, that women and children are employed in breaking stone for roads in many parts of England, because their labor can be obtained for next to nothing. The American people

do not want any Macadam roads if they can not obtain them without degrading women and children by putting them to stone-breaking, the vocation of criminals, and pauperizing them by such unnatural labor; but the employment of penitentiary and jail convicts at road-making, instead of contracting their labor to be put in competition with free labor, is well worth more serious and intelligent consideration than it receives. Why not take the tramps, who are more or less a terror to the rural districts and a nuisance in cities, and place them at road-making, feeding and clothing them well? Those of them who are unfortunate and would not tramp could thus have the means of subsistence until they could find better employment, while those who are vagabonds could be made to earn their bread.

In France the work of constructing roads was practically completed some time since, and the republic has the most magnificent system of roads in the world. The materials used in their construction are granite, flint, furnace refuse, broken brick and quartz. Like the English roads, they consist of from four and a half to ten inches of broken stone without any foundation except the removal of the surface soil, and cost from $3,000 to $10,000 a mile. They are looked after very closely. Even dirt is removed from them. Of course the cost of the maintenance of such roads is possible in France because of the density of the population. The roads there are saved a great deal by the wide tires for wheels, which are in universal use in England and most European countries, as well as France. But, despite the great cost of the roads in France, the people best informed are certain that they are the best sort of an investment, having increased the value of lands immensely by putting the farmers of a few acres, whose thrift and frugality are largely the source of France's prosperity, in easy communication with the markets. In fact, the French system of roads is regarded as a potent factor in the material prosperity and marvelous financial elasticity which has made that land and people the wonder of the world.

Germany's system of highways is well nigh complete, having been constructed in the years just before the advent of the railroad. Indeed, such states as Indiana might now have better main lines of highway if the railroad had been a quarter of a century later, but it would not have been nearly so populous and wealthy a commonwealth. The older roads of Germany have the old foundation which was general before Macadam, but those made in recent years conform to English models, those about Frankfort-on-the-Main costing from $2,600 to $3,600 a mile.

In some countries, particularly in Saxony and Austria, the law requires that there shall be no fence along the highways, the line of the road being marked by rows of trees. In Saxony fruit trees are planted, and the government last year derived $37,000 from the sale of fruit of the highway trees. Where fruit trees do not flourish trees which can be used for timber are planted.

The fund of information which the state department has collected should be turned to practical use by people in the United States. When intelligent and progessive men are impressed with the fact that farm property will be greatly enhanced by such roads and farm life be made more attractive when isolation from the city and village is not enforced by roads of mire, which involve not only the wear and tear of carriages and animals, but positive danger to life and limb after night, the permanent country and village road will come.

ECONOMICAL ROADS AND STREETS.

By J. M. Heiskell.

CAPTAIN F. V. GREENE and others say that pavement is cheapest (most economical) which for a given cost affords least wear to itself and to passing vehicles. In a sense this is true, but it is not clear that he included as an element in lessening the effect upon the vehicles the condition of the vehicles themselves. His statement is not correct in any case. The cheapest road or pavement is that which for a given first cost, and a given tonnage, causes the least wear to itself and vehicles passing over it, *and which is used by the least destructive vehicles.* Aside from the extremely important matter of springs, or else the more important matter of no springs on vehicles, let us consider the effects of improper or insufficient tire widths. Say we fix, as we can, a limit of allowable or economical cutting or crushing effect. A given load on some width of tire will produce this allowable cutting effect. Then will twice this load on the same width of tire produce at least four times this cut. This is based upon the fact that a double load requires exactly double the area of contact to support it, or what is the same thing, suppose the material of the road or pavement to be homogeneous—no harder to cut through, or compress at a depth equal to the depth of cut, than at the surface.

While it is true that this assumption may not be correct for earth roads and some other of the softer roads in any given condition, it is equally true that the damage due to letting water into the road by insufficient tires, much more than compensates for the difference or divergence from theory. In fact with sufficient tires any reasonable earth road is easily kept drained, while with narrow tires proper drainage is impossible.

In order to obviate the necessity for any assumption, we may find the diameter of wheel required to carry double the load carried by a smaller wheel, without cutting deeper than that smaller wheel, hence meeting an exactly equal resistance to rolling and doing same work upon the road. For slight cutting the required diameter would be nearly four times that of the given wheel; for greater cutting of both wheels, the difference in diameter is somewhat less; the ratio of sizes is somewhat nearer three to one, or further from four to one. In short, to secure the necessary bearing for a doubled load without producing a cutting effect greater than that due to the original load, we must either make our wheel about four times as large in diameter or else double the width of tire. The extra cost of a double width would not be more than ten per cent., probably no more than five per cent., of the cost of the vehicle, and is not worthy of consideration when compared with the much greater consequent saving, even in total cost of the vehicle itself.

Memphis, Tenn., Nov. 18, 1891.

AN EXPERT'S ADVICE REGARDING ASPHALT AND CEMENTS.

MR. CLIFFORD RICHARDSON, inspector of asphalt and cements of the engineering department of the District of Columbia, was recently asked by the Denver Board of Public Works to visit that city and make an investigation of the merits of the methods and materials of the two asphalt paving companies engaged in putting down pavements there, and also to answer certain questions relating to paving, propounded by the board. After giving an impartial opinion regarding the two companies, Mr. Richardson, in his formal report, gave the following advice in reply to the board's inquiries:

"It is desirable that laying of hydraulic cement concrete should cease as soon as atmospheric temperature is liable to cause congealing of the water in the mortar. In cold weather it must also be remembered that concrete acquires strength much slower than in warm.

"The length of time before which surface should be laid on hydraulic concrete base depends upon two conditions, the character of the cement and atmospheric conditions. It is desirable that ten days, at least, should elapse before surfacing, accompanied in warm weather by frequent sprinkling. There is no objection to laying surface in cold weather if proper attention is paid to the temperature of the mixture.

"It is most desirable, under ordinary circumstances, to await natural settling on streets where much trenching is done, but in your very sandy soil flooding, I should think, would accomplish the same result satisfactorily.

"Bituminous base is unsatisfactory, except on suburban streets or those having very light traffic, and where the subsoil base is compact and firm. It should not be used on streets where trenching has been recently carried on. Bituminous binder is a most

desirable modification of your present method of laying pavement. It has been practiced with success in Washington for some years.

"Cushion coat has not been laid in Washington since my official connection with the paving industry. I do not think it advantageous, except, perhaps, with unskilled labor.

"The following are extremes of temperature which, in my opinion, are allowable:

"In refining, not over 400 degrees Farenheit.

"In oiling, not over 325 degrees Farenheit.

"Asphalt cement, lowest, 275 degrees; highest, 310 degrees.

"Sand, lowest, 250 degrees; highest, 300 degrees. In cold weather not lower than 280 degrees.

"Mixture, not lower that 250 degrees in summer, or 275 degrees in winter; never over 300 degrees.

"In Washington asphalt surface is carried flush to grooved rails, manholes, curbs, etc., except on very flat grades where gutters are laid in vitrified brick. Against such rails as are laid in Denver, a line of stone paving block, header and stretcher, should be laid.

"Cold or chilled mixture should never be allowed upon a street in any form, either in loads or scraps. No compaction can be obtained with such material. Reheating of surface mixture has not been practiced successfully in my experience.

"Rolling should be done rapidly and before cooling of the mixture, at first with hand rollers, then with lighter steam rollers, and finally with a heavier, broad-tread steam roller for the production of an even surface, the heavier roller being applied before the surface is chilled, but not before it has sufficiently solidified to withstand the weight applied without injury.

"As to obtaining uniform results in the composition and laying of paving asphalt, I have already suggested the system developed after many years of experience in Washington, and which is there successful. This provides for a full corps of inspectors and a chemist of experience. Of course this system must be slowly developed by you, and I should recommend that some one be sent to Washington to become familiar with the system in use there.

"Too many considerations and conditions enter into this question for me to be able to give even an approximation to an answer. The amount of damp or wet filth on the surface must be very detrimental, unless the surface is a very perfect one.

"I see or know of nothing in the climate of Denver which should have any effect of a deleterious nature upon asphalt pavement, but should wish to make the surface as rich in bitumen as the quality of the sand will permit. Experiment alone will show how the available material may be combined. I should consider it a very important matter to improve upon the quality of the sand now in use by both contractors.

"The replies given above are in accordance with the experience which I have met with in Washington and with practice there."

CHICAGO CITIZENS INSPECT A BRICK PAVEMENT.

THE *Chicago Times* recently contained the following account of the visit of an excursion party from that city to Evanston to inspect the new brick street pavement there: "A party of Chicago gentlemen went over to Evanston to inspect a street recently paved with brick, with results which were surprising to all. The study of clays for pavement brick making has received much attention during the last few years owing to the rapidly increasing popularity of this material for streets and roadways While many clays will make a good brick if properly burned, the shale clay has proved the most serviceable. The brick used at Evanston was made at the Purington yards at Galesburg, Ills., where the shale clay was first discovered to be useful for this purpose, the first pavement brick being made there seven years ago, since which time a number of brick-yards have been established in different parts of the country where the clay is found. It is named vitrified paving-brick and has attained a remarkable popularity as a street and road maker during the last seven years, there being about two hundred and fifty miles of it used in the various cities of the United States at the present time. It can be laid cheaper than any other pavement except wooden block. It wears as well as granite, is much easier laid and repaired, and when properly laid has a surface equal to the best pavements in use. The vitrified paving-brick is impervious to water and has stood a most satisfactory test of climatic influences. The table of averages from a compilation of the cost of the four leading paving materials in twenty different cities gives the following results: Granite block, $3 per square yard; asphalt, $2.60; vitrified brick $1.75, and wooden block, $1.50.

"D. V. Purington has given many years to the study of brick-making and clay working. His yards at Galesburg turn out 150,000 vitrified paving-bricks a day. They have shipped this year to Galesburg, Rock Island, Moline, Canton, Rockford and Evanston, Illinois, and to Davenport, Fort Madison and Clinton, Iowa—Rockford having used about two miles, Davenport the same, and Rock Island and Moline three miles.

"The first prick pavement in this part of the country was laid at Bloomington in this state some fourteen years ago, and is in first-class condition yet. Mr. Purington is of the opinion that the coming pavement is brick, and that before many years vitrified brick will be produced sufficiently cheap to warrant the paving of country roads. The only brick pavement in Chicago is in front of the Chicago, Burlington and Quincy depot, on Canal, between Polk and Harrison streets and a small intersection of Chicago avenue. The latter, however, are not vitrified brick."

THE PAVEMENTS OF CHICAGO.

STREET pavements and road-making absorb nearly one-half of the total annual municipal expenditures in this city. It is a subject probably not less understood by the general public than other improvements, but unfortunately with them does not receive the individual attention given to strictly private interests. Good pavements are the foundation of commercial prosperity in a great city. In a residence street they are the outer court-yard to each residence and deserve the same consideration from each property owner as his house and lawns. A fine house in a cheaply paved street is less in harmony than a cheap house on a fine boulevard. Chicago has developed so rapidly that much of the harmony in public and private improvements observable in Paris, Berlin, and Vienna has been overlooked, or, as Kipling might say, presumptiously debased.

It is doubtful, however, that it is owing to lack of taste or appreciation of harmony, for the houses of Chicago are a delight to all foreigners. The fault is more directly attributable to apathy among property-owners, too much politics in municipal government, and the aggressive real-estate subdivider. The property-owner pays for the street pavement, and it is his duty to be vigilant in securing always a good, serviceable pavement, which in matters of first cost and maintenance should always be in accord with the values of property on that street. It is a great burden on property worth $40 per front foot to load it down with a pavement costing $10 per foot to lay and yearly expense to maintain. It is likewise poor economy to place a cheap pavement where property is worth $400 or more per front foot. A uniform rule might be adopted by the city council suiting the pavement to the values of real estate and amount of traffic passing over it.

More than eighty per cent. of all the pavement used here is wood, either of cylinder block or parallelogram block. It is the cheapest of all in the first cost and may reasonably be said to have two of the requirements of a perfect pavement. It affords good footing for horses when in good condition and is comparatively noiseless, but in the other qualities it is among the worst. It is always dirty, most difficult to keep clean, and retains all the filth and germs of typhoid and other contagious diseases which come in contact with it; when dry it is dusty, when wet it gives off a disagreeable odor. It is expensive to keep in repair and should never be laid in streets with any considerable traffic. It is more desirable for cheap property, where travel is light. The streets of London are now being paved with wood to a considerable extent

but it is a wood pavement superior to any used in this city and they have resorted to it to suppress the intolerable noise of street traffic.

Of granite pavement, about thirteen per cent. is used here. It is also parallelogram in shape. Granite has probably proved the most economical of all in wearing qualities. It is not an easy pavement to keep clean but much easier than wood. It is the most noisy of all pavements, and it has a capacity for jarring that must soon receive the serious attention of architects of the high buildings. Were it not owing to the iron frame work now used so extensively in the consturction of large buildings, more of them would share the same fate as the post-office.

The granite pavement in Chicago has not had a fair test as to even surface and cleanliness. If it were not disturbed after first being laid it would have comparatively an even surface, and therefore have but little capacity for retaining filth, but it is torn up two or three times each year and relaid in a most careless manner. For this reason it does not appear to the same advantage as that on Fifth avenue in New York. An erroneous impression seems to be prevalent about the traveling surface of granite block as compared with asphalt and wood in relation to the slipping of horses. A series of observations made by Francis V. Green, captain, corps of engineers, United States army, in one hundred and ninety-two days in thirty-two different streets of ten different cities, and including 807,552 horses and 81,051 miles traveled, gives the following result: A horse will travel 583 miles on asphalt without meeting with an accident of any kind, 413 miles on granite, and 272 miles on wood. Colonel Haywood of the British army, in a similar series of observations on the pavements of London, noted the following results: On asphalt a horse will travel 191 miles without accident, on granite 132 miles, on wood 330 miles. The difference between the reports may be accounted for partially in this way: London is a damp and foggy city, therefore, its pavements are more slippery than those of the ten American cities where Captain Green's observations were made.

A trifle over three per cent. of the pavements in Chicago are asphalt, less in proportion than that used in most of the large cities in this country. None of it has been down here long enough to give it a thorough test, therefore we must rely on the experience of other cities. There are many kinds of asphalt and its adulterations, and several methods of applying it, but the six-inch cement base, with a wearing surface of genuine asphalt, has proved the finest known pavement both in Europe and this country. Berlin, which may be cited as the best-paved city in the world, has abolished macadam and wood and uses almost exclusively stone and asphalt. Their stone pavements are as smooth as a floor, much superior in workmanship to our granite. They have increased the use of asphalt at about twelve per cent. each year for the last seventeen years. Berlin is said to be the cleanest city in the world and at the least cost per square yard. Paris is replacing macadam with asphalt because the maintenance of macadam costs them about forty-five cents per square yard each year. The cleaning is also expensive, whereas the cleaning of an asphalt surface is the least of all known pavements.

Much of the asphalt used in London and Paris is the fine-grained Neuchatel. It has a smooth surface and consequently is much more slippery than the gritty Trinidad asphalt used in this country.

Macadam is used on the boulevards to some extent in this city. It affords the best driving surface of all pavements when laid with a good foundation and a fine surface dressing. Where driving is paramount to all other uses of a pavement it would be difficult to find anything equal to the macadam boulevards of Chicago. But it is an extremely dusty pavement, not intended to be kept clean, and very expensive in its maintenance. Paris spends $1,000,000 per year in the maintenance of its macadam boulevards. Boston spends fifty cents per square yard per year for the same. It will not stand under heavy traffic and therefore is only desirable for special streets.—*Chicago Times.*

GRAVEL ROADS.

To the Editor of Paving and Municipal Engineering:

DEAR SIR—I have been looking over back numbers of some of the periodicals that discuss road improvements, including your esteemed paper, for an article relating to gravel roads, and find nothing bearing on the proper proportion of gravel, sand and loam, or the best ingredients for cementing the gravel and making a gravel road a water-shed as well as to bear up under heavy loads. Also, the importance of underdrainage, especially where the roadbed is lower than adjoining lands and the advantage of rolling as the gravel is put down. This subject, in all its bearings, treated from a scientific stand-point by one who has experience in making good gravel streets and roads would save to tax-payers much useless expense in the construction, and secure roads that will give entire satisfaction. Can you have an article on this subject in your next number?

There is being constructed in this place a gravel street excavated for the most part 2 to 4 feet below the lots, and coarse gravel dumped in 16 inches deep at center, without underdrainage or rolling, with the expectation that it will pack without the cementing qualities. The wagon wheels plow it up while passing over and must continue to do so till enough mud is hauled on by the wagon wheels to make a band, and still the method has many advocates. GEO. S. POLLOCK.

Sullivan, Ind., November, 1891.

VENTILATION OF SEWERS.

To the Editor of Paving and Municipal Engineering:

SIR—I would like to call your attention to the question of ventilating sanitary sewers when laid with sewer pipes less than twenty-four inches in diameter, where no man is ever expected to go through to clean them. What does it matter if the sewer is full of marsh gas, pure air or some other kind of gases, if they are not explosive? If those gases, or even pure air, must have a way to get out occasionally, and if the houses are properly provided with soil pipes carrying those deleterious gases above the roofs, is there any necessity to have ventilated man holes, and lamp holes, and even, as some cities do, to place ventilators along the sidewalks at each house connection? It appears quite paradoxical that we should spend so much money to bury pipes in the ground to get our sewage out of sight and in the same time take all due precautions to return the gas it generates to our lungs. ARTHUR LAGRON.

Freeport, Ill., Nov. 19, 1891.

CONVICT LABOR IN ROAD MAKING.

THE Georgia Road Congress has adopted a resolution approving of the use of convict labor in road-making, and holding that labor and property should each bear their fair proportion of road duty, the latter to be an ad valorem tax. Each county is to decide as to the amount and character of the work to be done and own and furnish the tools to be used. A complete revision of existing road laws is earnestly recommended. At the congress the Highway Improvement Association was formed, with all citizens of Georgia eligible to membership on the payment of 50 cents per annum.

TORONTO'S STREET RAILWAY FRANCHISE.

THE street-car lines of Toronto have been secured by the municipality, and the city has leased them to private individuals for a term of years, receiving as rent $800 a year per mile of track, or $1,600 per mile of double track, and 8 per cent. of the gross earnings. Workingmen can secure eight-trip tickets for 25 cents, good for any time before 8 A. M., and between 5 and 6:30 for the return home. Children under 9 years are carried for half rates, and school children's tickets are sold in bunches of 10 for 25 cents. Under this system the first month's returns placed $11,651 in the city treasury.

Improvement and Contracting News.

PAVING.

Eighth street, Benwood, W. Va., is being paved.

A number of streets are being opened at Carlisle, Pa.

The streets of Evansville, Ind., are being paved with brick.

Irvington street, Malden, Mass., is to be widened to sixty feet.

Main street at Wellinton, Ill., is to be paved at a cost of $5,000.

A movement has been started for paving the streets of Cape May, N. J.

Second street, Memphis, Tenn., is being paved with the Hallwood brick.

The road leading to the Ohio Reformatory will be macadamized this fall.

The new brick pavement on Franklin street, Saginaw, Mich., is completed.

It is quite likely that the city of Kenosha, Wis., will improve its streets next year.

Bays-Jeffreys Co. has the contract for graveling about a mile of streets at Salem, Ore.

The Board of Aldermen of Galveston, Tex., has voted to pave forty blocks of streets.

132d street, Westchester, N. Y., is to be graded, curbed and flagged for a distance of 3,600 feet.

The Denver Gilsonite Paving Company has been incorporated. It will lay Colorado asphalt paving.

The city engineer of East St. Louis is making a survey of Broadway preparatory to paving it with granite blocks.

A contract has been let for the grading of five miles of street in the Denny and Fuhrman addition to Latona, Ore.

A new flag-stone pavement is being put down on the southeast corner and the east side of the court-house at Paola, Kan.

The work of opening and grading the streets of the new town of Hammondville, Pa., is being pushed with great energy.

The superintendent of streets of San Francisco, Cal., recommends that bituminous pavements be laid on eight streets.

There is a plan about complete to widen Fifth avenue to Arlington, at Columbus, O., and macadamize with crushed stone.

By means of the tramway, Twenty-third street, between Madison and Adams avenues, Salt Lake City, Utah, is being graded.

Rock street, Little Rock, Ark., is to be paved from Elm to Fifteenth streets with vitrified brick. W. A. Doyle has the contract.

The three miles of grading to be done between Eureka and Monmouth, Utah, by the Springville Grading Company, has been commenced.

Contracts have been let by the Chicago Heights Land Association to the extent of $175,000 for macadamizing the streets of Chicago Heights.

The contract for 74,600 square feet of cement sidewalk in Garfield Park, Chicago, was awarded to Schillinger Brothers at 15 cents per square foot.

The south side of the boulevard at Oakland, Cal., is to be macadamized at once, and the contract has been let to the Oakland Contracting Company.

The sum of $18,000 will be raised by issue of bonds to pay for laying of asphalt pavement on Academy, South Maine and other streets in Wilkesbarre, Pa.

The Southern Construction Company will pave McCallie avenue, Chattanooga, Tenn., from the East Tennessee bridge to East End avenue, with brick for $21,525.

The board of public works awarded the contract for grading the approaches to the Reaney street bridge and the alley in block 54, St. Paul, Minn., to Michael Lux at $2,649.

The contract for furnishing 6,000 feet of stone for the curbing of State street, Salt Lake City, has been sublet by the Pacific Paving Company to the Metropolitan Stone Company.

The streets of Mt. Vernon, N. Y., are being greatly improved. A foundation of large stone is covered with a top dressing of macadam, which is afterwards rolled until smooth.

The city of Duluth, Minn., and suburbs have made about $1,400,000 worth of improvements this year on streets in grading and paving, and in putting in sewers and draining walls.

Marinette, O., has now one and three-quarter miles of street paving completed; 18,342 square yards were laid this season at a total cost of $17,183.90. More will be done next year.

An ordinance was presented to the board of aldermen of Covington, Ky., requiring that hereafter, on asphalt paved streets, sidewalks shall not be of brick, but of flagging or cement.

Engineer Sering has just completed a survey for extensive improvements in West Madison, Ind., and new pavements will at once be laid on the south side of Main street for a distance of 1,200 feet.

Three miles of brick pavement has just been completed in Clinton, Iowa, as this season's work, and makes a grand total of seven miles of paved streets now in that city, none less that forty feet wide.

Bash & Paul were awarded the contract to pave with Trinidad asphalt, Griffith street from the south line of Berry street to the north line of Wayne street, at Fort Wayne, Ind., for $2.64 per square yard.

Jefferson county, Ala., has 113 miles of macadamized roads, to which 37 more miles will soon be added, making a grand total of 150 miles. These roads are the almost priceless possession of Jefferson county.

The Wasatch Asphaltum Company has secured the contract to pave Richards avenue, Salt Lake City, Utah, with asphaltum, including sidewalk. North Temple street is also being graded beyond the Jordan and being made into a fine road.

H. B. Palmer, formerly of Indianapolis, has been awarded the contract for the paving of Main street, Helena, Mon. The pavement will be wooden blocks laid on a foundation of six inches of broken stone. The contract will amount to about $60,000 and is to be finished by November 15, 1892.

The Vulcanite Paving Company has a contract for paving North Broad street, Philadelphia, Pa., with asphalt and to test the merits of the material, one block will be laid with rock asphalt and the remainder with Trinidad.

Smith & Son, contractors, of Norristown, Pa., have been awarded the contract for laying one of their patent pavements from Devon station to Devon Inn, Delaware county, Pa., a distance of a mile and a half in length. It will be eight feet in width.

Bridgeport, W. Va., is paving Bank street, having it completed between Pike street corner and Baggs' mill. It is now being paved toward Kirkwood. There is no doubt but that this great improvement will lead to the final paving of all streets of the above-named place.

On account of the ground being so dry and hard, the street plows proved ineffectual in the grading of the road south of Clifton, W. Va., the grade of which had to be cut down twelve to fifteen inches in some places, and the contractors found it a hard job because it had to be done with pick and shovel.

The Portland Bituminous Paving and Improvement Company have completed the bituminous pavement on Washington street, Portland, Ore., and that city can justly boast of having one of the finest thoroughfares in the northwest. It is also proposed that both Morrison and Third streets be paved with the same material.

The city of Utica, N. Y., is authorized to raise by general tax the sum of $50,000 every year for paving purposes. Out of this sum the city pays one-third the cost of every pavement, the remaining two-thirds being raised by local assessment. She is given $150,000 worth of paving a year and this amount spent annually should pave the city pretty well.

At a meeting of the street committee it was decided to use Waynesburg fire brick for paving on Thirteenth street, between Washington and Lafayette streets, at Toledo, Ohio. Ordinances were also passed for the improvement of Fourteenth street from Monroe to Washington, First street from Oak to Yandota streets, and Park street between South street and Western avenue.

The Buffalo Paving Co. has paved Purdy street, Buffalo, N. Y., for a distance of 700 feet with vitrified brick laid edgewise on a cushion of two inches of clean sand on a six-inch concrete base, as for an asphalt pavement, and the interstices between the links are filled with a composition of pitch and ten per cent. of asphalt. A pavement of this kind costs from $2.75 to $3 a square yard, and if all that is expected of it is relized, it may become popular and be largely introduced.

Specifications were submitted to the West Park Board of Chicago, for the improvement of Humbolt boulevard from Western avenue to North avenue; Central boulevard from Augusta to Kinzie street, and Southwest boulevard from Nineteenth street to the Illinois canal. This completes the boulevard system of the West Side with the exception of the boulevard between Garfield and Douglass parks. The specifications are for the central drive only. This is to be paved with granite macadam and the specifications call for work amounting to $307,163.

SEWERS.

Salem, Ohio, needs a new sewer system.

The sewerage system of Columbus is to be improved.

Winona's (Minn.) new sewer system is nearing completion.

There is a demand at Vincennes, Ind., for a sewerage system.

Negaunee, Mich., will expend about $20,000 on a sewerage system.

Work on the Georgetown, Col., sewers will be pushed as rapidly as possible.

Meriden, Conn., has bought twenty acres of Falls Plains for sewerage purposes.

The sewer on Goodman street, Rochester, N. Y., is to be extended at a cost of $2,550.

The contract will soon be let for the proposed great sewer on Melrose avenue, New York City.

A meeting will be held at Port Richmond, N. Y., to discuss the introduction of a general sewerage system.

Details of proposed sewers on Colbert street and Myers alley, Oil City, Pa., will be given by the city engineer.

The new sewer planned for the west side of Main street, Eaton Rapids, Mich., is estimated to cost $1,228.70.

A line of sewers will be put in at Jerseyville, Ill., this winter, and a general system will be added next spring.

Mr. Loweth, of St. Paul, Minn., is to prepare plans and specifications for a system of sewerage for Owatonna, Minn.

Specifications for the proposed East Side trunk sewer, Rochester N. Y., have been completed by City Surveyor Peacock.

A contract for cross-town sewers amounting to $68,000 has been let by the water commissioners of Lansingburgh, N. Y.

J. Creem was the lowest bidder for the section of the sewerage system of Ward 26, Brooklyn, N. Y. His bid was $66,958.

Twenty-eight thousand dollars is to be expended for the building of a sewerage system for the central part of Waukegan, Ill.

An expenditure of $77,500 is proposed for sewers for New Bedford, Mass., the amount to be raised by the issue of city bonds.

Contracts for the big sewer at Harney, Ill., have been let to Michael Joyce, of Englewood. The improvement will cost $40,000.

The main sewer will be six feet in diameter according to the plans adopted, for the south side of Findlay, Ohio, by the city engineer.

W. C. Hamilton, city clerk, Bayonne, N. J., will give details of proposed sewers on East Forty-sixth, East Forty-fourth, and other streets.

The San Francisco sewer association was awarded the contract for the sewer pipe to be used in the construction of sewers at Spokane, Wash.

Col. Geo. E. Waring, Jr., has been engaged to formulate plans for the sewerage of Monongahela City, Penn., is now making plans for Manchester, Va., and has contracted with Mansfield, Ohio, for plans for a system of sewers.

The contract for the construction of Lorain's (Ohio) main sewer was awarded to Contractor Powers, of Fremont, for $26,441.14 by the council.

Nearly eleven miles of sewers have been constructed during the last three years at Westfield, Mass., and it hopes to complete the system next year.

The city council of Beaumont, Tex., has contracted with J. S. Thacher, of Dallas, for $650, to make surveys and specifications for a system of sewers.

Six hundred sixty-five thousand dollars for main sewers and $200,000 for branch sewers is recommended by the finance committee of Philadelphia.

Plans for twelve inch terra cotta pipe sewers for the east side of Portland, Ore., have been prepared by D. W. Taylor, superintendent of the streets.

The work of constructing the sewer cisterns at Third and St. Clair, Second and St. Clair, and Third and Kenton streets, at Dayton, Ohio, has been completed.

Mr. M. J. Butler, Am. Soc. C. E., has been appointed by the town council of Deseronto, Ontario, to examine into and design a system of sewerage for that place.

All bids for the outlet sewer at Orange, N. J., have been rejected. The committee is directed to prepare new specifications and get new estimates for the work.

The State Board of Health has rejected the plans for the proposed system of sewerage for Far Rockaway, N. Y., and new plans will be called for by the town clerk.

A town meeting will be held at San Rafael, Cal., January 23 to vote on the proposition to issue bonds to the sum of $25,000 for the construction of a sewerage system.

The question of a system of sewerage for Wilkinsburg, Pa., is deeply agitating the people of that borough. Edenburn & Cooper, the engineers, are preparing plans for a system.

One of the longest sewer systems in the Northwest is one crossing the city of Portland, Ore., in a northeasterly direction from the city park and emptying into Guild's Lake.

Sealed proposals will be received at the office of the village clerk of Painesville, O., until 12 o'clock, noon, December 18, 1891, for the construction of a sewer on Main and St. Clair streets.

Certain residents of Dauphin street, Mobile, Ala., have been granted permission to build a sewer on said street from Royal to St. Emanuel street. The city engineer will give details of same.

Charles C. McColgan & Co., at a bid of $2.70 per barrel, was awarded the contract to furnish Hanover Portland cement for Eagle street, Fulton avenue and Monroe street sewer, at Baltimore, Md.

The contract for building the Beidler Creek sewer outlet at Muskegon, Mich., was awarded to Thacher & Breymann. This is the first step towards building Muskegon's sewer system according to the plans of G. S. Pierson, of Kalamazoo.

The council committee on sewers have recommended that a sewer be built along Willow run, Covington, Ohio, and that a strip of ground eighty feet in width be purchased; said sewers are to be twelve feet in diameter and estimated cost of same being $100,000.

W. P. Rounds has been appointed superintendent of public works at Morgan Park, Chicago, and will push the $200,000 sewers and $300,000 water mains already contracted for.

The Public Improvement Commission, of Troy, N. Y., has recommended that the sewer between the east side of River street and Mechanics street be rebuilt for about 300 feet; also that sewers be built in Fifth avenue and Ingalls and other streets.

An ordinance was adopted by the board of aldermen of Pawtucket, R. I., providing for the appropriation of $1,200 for the construction of a sewer on Belmont street, from West avenue to Pawtucket avenue, for the disposal of surface and storm water.

Surveyor Corbin has completed the specifications for a big sewer to be built from the East end market house to Second street via Walnut street, at Lexington, Ky. It is to be constructed of stone from a 5x8 feet cylindrical to a 5-foot diametrical at a cost of $5,200. A complete system is also being discussed.

Mr. Robert Gayal, chief engineer of the City of Mexico, has, for about six years, been engaged upon a most extensive system of sewer work in that city, which, it is said, is to cost $16,000,000, and upon which the sum of $3,500,000 has already been expended. He has visited the bureau of surveys at the City Hall at Philadelphia, and looked into the construction of main sewers, etc.

WATER-WORKS.

Rockford, Mich., wants water-works.

Spring Valley, Ill., is going to have water-works.

The new water-works at Franklin, Ind., give perfect satisfaction.

Bonds for water-works at Benton Harbor, Mich., have been sold.

Los Angeles, Cal., is making a move to own her own water-works.

The water mains of Geneva, N. Y., are to be extended to Torrey Park.

Excelsior Springs, Mo,, is to have a water-works system to cost $25,000.

Kent, Wash., has decided to issue $15,000 worth of bonds to build water-works.

A movement is on foot at Shelbyville, Ky., to organize a water-works company.

New 100 horse-power boilers are to be placed at the water works at Youngstown, Ohio.

Bellevue, O., is considering the advisability of erecting a new water-works standpipe.

The question of building water-works for Kirkwood, Ill., is decided in the affirmative.

Bonds to the amount of $20,000 have been issued for water-works at Arkansas City, Kan.

Water mains are to be extended on Muench, Verbeke and other streets at Harrisburg, Pa.

Work is being rapidly pushed on the water-works now in process of construction at Hubbard, Iowa.

A new supply for the St. Johnsbury, Vt., water-works is projected and will probably be discussed at a village meeting in January.

Michael Collins will build a complete system of water-works for Collinsville, Mass., to cost $150,000.

A system of water-works is being erected at Harrodsburg, Ky., with a daily capacity of one million gallons.

The city engineer of Los Angeles, Cal., is preparing plans for a water-works system to be owned by the city.

South Haven, Mich., will put in a water-works system and will take its water supply from Lake Michigan.

The net profits of the Philadelphia water-works are a million dollars or more a year and are owned by the city.

The contract for water-works for Teekoa, Wash., has been let to George Sutherland, of Walla Walla, for $12,812.

Jackson, Minn., has decided to issue bonds for $10,000 for the erection and maintenance of water-works.

Bonds to the amount of $15,000 have been voted for the construction of a water-works system at Fairbury, Ill.

The Santa Paula (Cal.) Water-Works Company has been incorporated to build works; capital stock $150,000.

The sum of $11,000 has been appropriated for the new reservoir basis for the water works at Woburn, Mass.

The West end improvement company is extending the water mains 900 feet on Ridge avenue, Hagerstown, Md.

A trade has been closed with Judge J. J. Abercrombie for the location of the water-works to be built at Opelika, Ala.

Mr. Clouser, of the common council of Reading, Pa., will give details of a proposed expenditure of $150,000 for trunk lines for water mains for that place.

Port Henry, N. Y., has voted for a system of water-works (gravity) to cost $50,000, and work on the same will be commenced at the earliest possible moment.

The city council of Chadron, Neb., has let a water-works extension contract to E. A. Rudinger, of Kansas City, for $19,525. Cast iron pipes are to be used.

The board of public works let the contract for the pipes on the water-works extension at Edison, Wash., to the Northern supply company for $1,747.41.

Philadelphia is considering the scheme of getting her water supply from the Lehigh Valley. It would involve an outlay of between $50,000,000 and $60,000,000.

Lynchburg, Va., has 20 miles of water mains, three large reservoirs with a capacity of 8,500,000 gallons and an abundant, unfailing supply of pure, healthful water.

Mr. O. B. Greeves received the contract for completing the water-mains at Beaumont, Tex. Mr. Greeves is the proprietor of the Beaumont foundry and machine shops.

The water-works company at Port Jervis, N. Y., has contracted with Benjamin Von Vrauken to raise the storage reservoir dam ten feet, which, it is said, will give an additional capacity of 90,000,000 gallons.

E. F. Layman, civil engineer, Cincinnati, Ohio, has made the preliminary surveys and estimates for the Wyoming, Ohio, water-works. Estimated cost, $30,000; system to be used, driven wells and storage reservoirs.

BRIDGES.

The Elmwood Park Company contemplates building a bridge at Lindondale, Wis.

It is expected that an iron bridge will be built across Black river at Port Huron, Mich.

Two bridges spanning the Snoqualmie river at Tacoma, Wash., have been swept away.

A bridge 3,200 feet in length is to be constructed at Wenatchee, Wash., at a cost of $500,000.

A new iron bridge is to be erected across the Sheboygan river at Kiel, Wis., at a cost of $2,100.

Great Barrington, Mass., has appropriated $3,500 for an iron bridge over the Housatonic river.

$15,446.18 has been appropriated for a bridge over the B & A. tracks at Winter street, South Farmington, Mass.

The bridge across the Mississippi river at Alton, Ill., which has been projected for several years, is to be built at once.

An iron bridge will be built at Whipple's Corners, Wyoming Co., N. Y., to take the place of the present wooden structure.

A bill will be presented at the next legislature providing for the extension of the Brooklyn bridge to the Brooklyn city hall.

A handsome new iron bridge will take the place of the old wooden one which crosses the tracks on Gordon street, Dalton, Tenn.

Details of proposed Hollow Street bridge, for which $1,300 has been appropriated, will be given by the clerk of the common council, Scranton, Pa.

The West Park Commissioners of Chicago, Ill., are considering the project of a bridge over the river at California avenue near Thirty-first street.

The city council, of Memphis, Tenn., has adopted a resolution providing for the building of a $10,000 iron bridge over Gayoso bayou at Mill street.

Plans for a drawbridge to cross the ship canal at Duluth, Minn., will be received until December 28th. Cash prize of $1,000 for the best plans furnished.

Eighty-five hundred dollars have been raised to be expended in constructing an iron bridge over Rock river, Jefferson, Wis., work to commence at once.

An ordinance has been passed calling for an election December 22 to vote on the question of bonding the town of Napa, Cal., to build a bridge at Third street.

The Saratoga County Supervisors have authorized the construction of a bridge across the Hudson river at Corinth, N. Y. The structure will cost about $18,000.

A resolution has been adopted authorizing the street commissioners to place a bridge across the mill ditch on Ninth street, between Larimer and Market streets, Denver, Col.

Action has been taken by the county commissioners and city council for the construction of a bridge at Delaware, Ohio, across the Olentangy river on the south limits of the city.

A county bridge is to be constructed over the Elkhorn at Atkinson, Neb.

A project to build a bridge across the river at California avenue, near Thirty-first street, is receiving consideration by the West Park Commissioners of Chicago, Ill.

The contract for a new bridge to span the Licking river at Thirteenth street, Covington, Ky., and Tibbatt's street, Newport, Ky., has been signed by a Cleveland company.

The Street Committee has been authorized to receive bids for erecting an iron bridge across the E. T. C. & G. track, from North Ninth to Fort Sanders avenue, West Knoxville, Tenn.

A committee has been appointed to confer with the city authorities in the matter of building a new bridge over the Weber river, at Twenty-fourth street, at Salt Lake City, Utah.

Resolutions have been adopted authorizing the street commissioners to place a bridge across the Mill ditch on Ninth street, between Larimer and Market streets at Denver, Colorado.

Fred. H. Smith, civil engineer, has stated that the lowest price at which the proposed stone bridge at North avenue, Baltimore, Md., can be built is $376,000. In view of this the Mayor recommends that an iron brige be substituted.

A company, under the title of Dao Railway Construction Company, has been formed and plans drawn for the construction of an elevated boulevard connecting the North and South sides, Chicago, Ill. The structure is to be of steel and have the appearance of a series of suspension bridges; estimated cost being placed at $2,300,000.

STREET LIGHTING.

Electric lights and water-works are to be established at Edinburgh, Ind.

The electric light plant at Asbury Park, N. J., is to be enlarged, at a cost of $8,000.

The common council is considering the purchase of an electric light plant for New Brittain, Conn.

Melrose, Mass., will vote, early in March, upon the question of a municipal electric lighting plant.

The city council of Columbus, Ind., has granted to Henry Bailey a ten years' franchise for an incandescent light plant.

The new electric light plant, at Braidwood, Ill., will cost $6,780, and will be put in by the Thompson-Houston Company.

Delegates have passed an ordinance granting an electric lighting franchise to the Western Electric Company, Seattle, Wash.

Hon. John Francis, of New York City, contemplates establishing an electric light plant in Paola, Kan.

The citizens of Quakertown, Pa., will vote, on December 29, on the question of issuing $15,000 of bonds to pay for a complete electric light plant.

Jonesboro, Tenn., is to be lighted by electricity, the light to be supplied from the Watauga Electric Light and Power Company, at Johnson City.

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Albert Miller, T. P. Ag't, C. & O. Indianapolis, Ind.

H. M. Bronson, A. G. P. Ag't, "Big 4," Indianapolis.

Proposals for Paving Streets.

SEALED PROPOSALS will be received at the office of the city auditor of the City of Dayton, until 12 o'clock, noon,

Monday, January 4, 1892,

For improving First street, from the west line of St. Clair street to the east line of Wilkinson street, estimate 11,000 square yards of paving.

Second street, from the west line of St. Clair street to the east line of Ludlow street, estimate 6,800 square yards of paving.

Third street, from the east line of Sears street to the river bridge, estimate 40,000 square yards of paving.

Fourth street, from the east line of Jefferson street to the east line of Ludlow street, estimate 4,500 square yards of paving.

Fifth street, from the railroad to the east line of Ludlow street, estimate 12,000 square yards of paving.

Main street, from the south line of Fifth street to the river bridge, estimate 25,000 square yards of paving.

Jefferson street, from the south line of Fifth street to the north line of First street, estimate 14,500 square yards of paving, by constructing necessary foundations, and making necessary excavation for the same, furnishing and paving the roadway with granite block, Medina block, Hayden block, Hallwood block, asphalt block, asphalt, red brick or fire brick, furnishing and setting new curbs, constructing the necessary culverts, drains, catch-basins, and retaining walls, in accordance with the plans and specifications on file in the office of the city civil engineer.

A deposit of five thousand ($5,000) dollars to be left in the hands of the city auditor, will be required of each bidder as a guarantee that if any bid is accepted a contract will be entered into and performance thereof properly secured.

All bids must be made upon the printed forms, to be obtained at the office of the board of city commissioners, and enclosed in a sealed envelope directed to the board of city commissioners, Dayton, Ohio, and indorsed upon the outside of the envelope, "Proposals for paving —— street in the city of Dayton."

Each bid shall contain the full name of every person interested in the same. The board reserves the right to reject any or all bids, or waive defects in bids in the interest of the city.

By direction of the board of city commissioners.

W. E. HOOVEN, President.

C. A. HERBIG, City Auditor.

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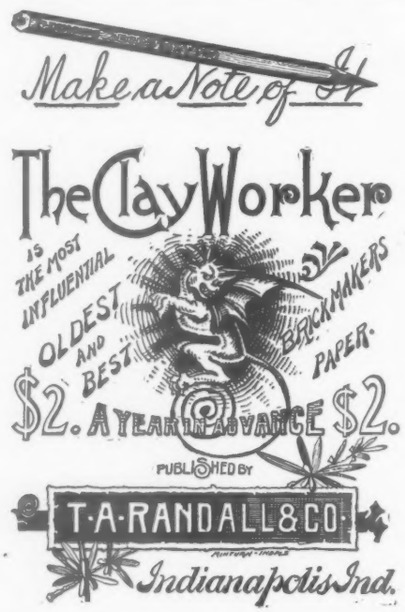
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M. D. WOODFORD, President, Cincinnati, O.
E. O. McCORMICK, G. P. & T. A., Cincinnati, O.

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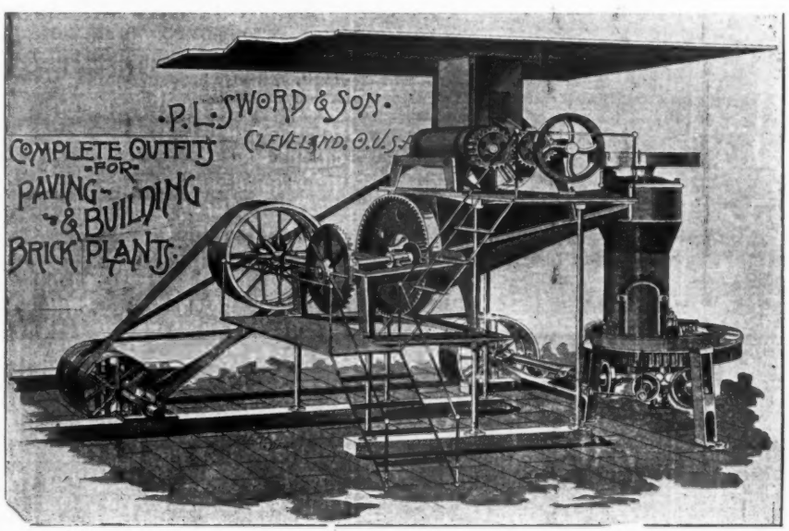

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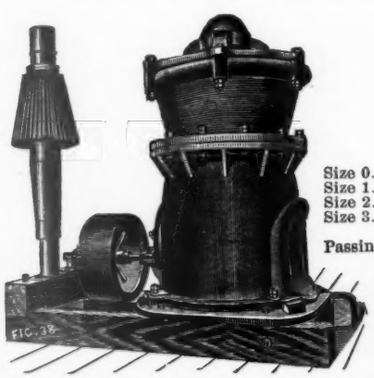

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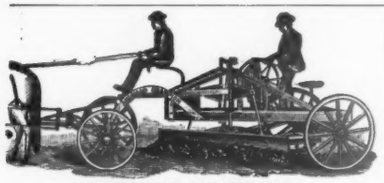

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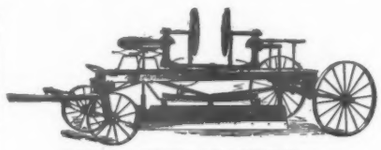

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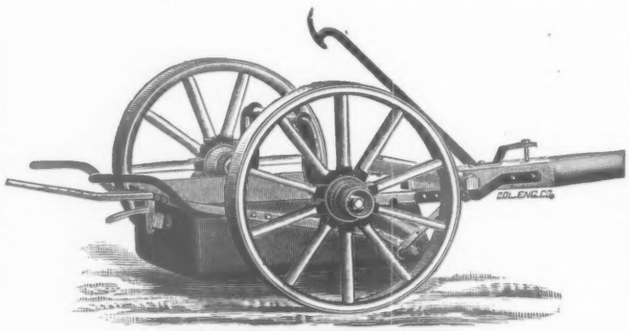

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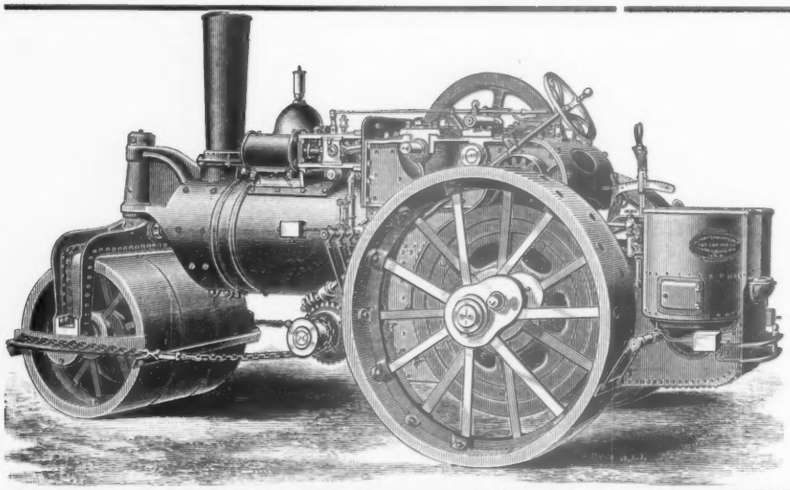

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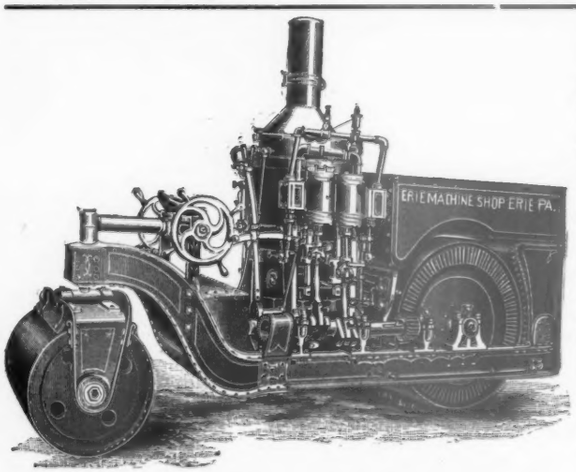

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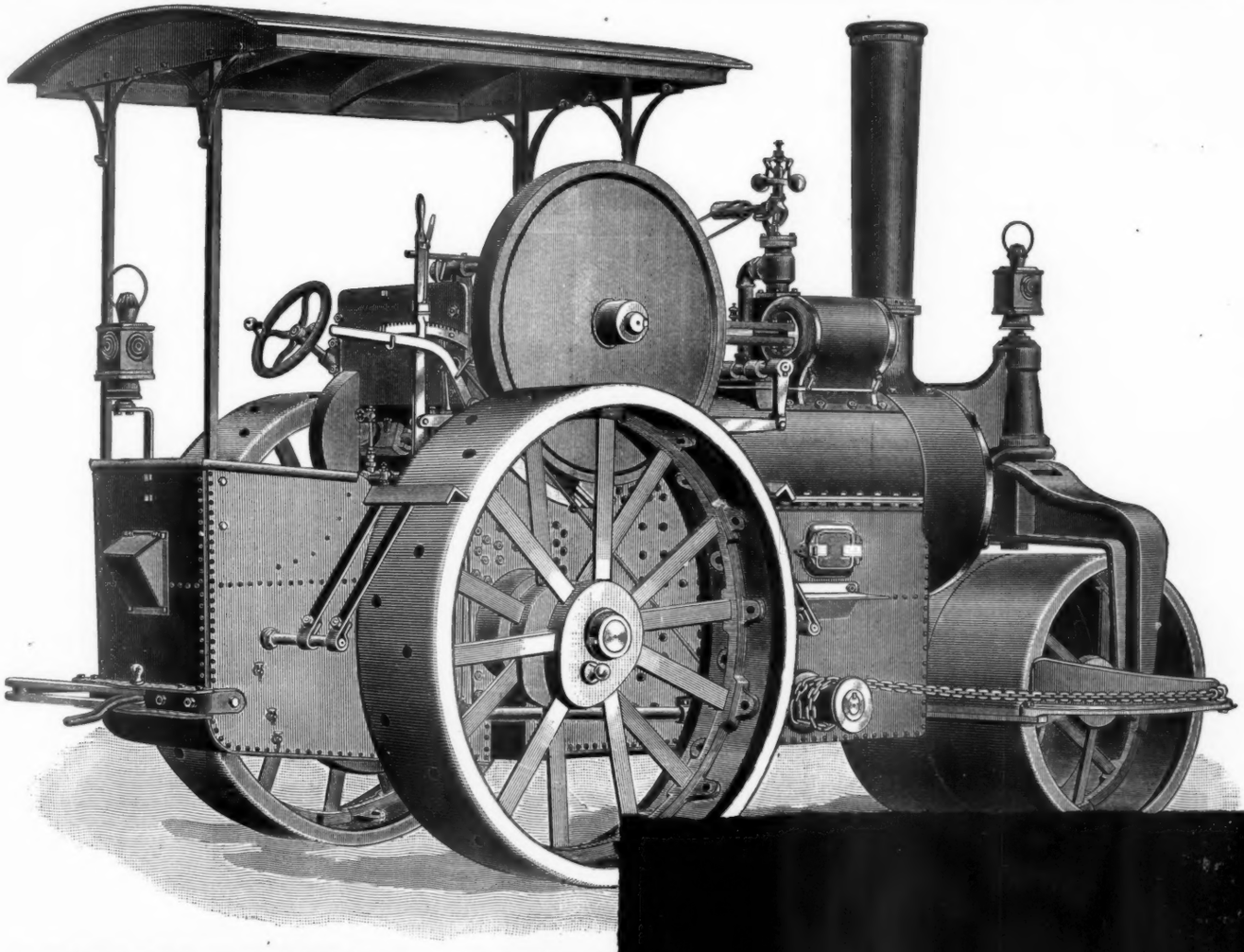

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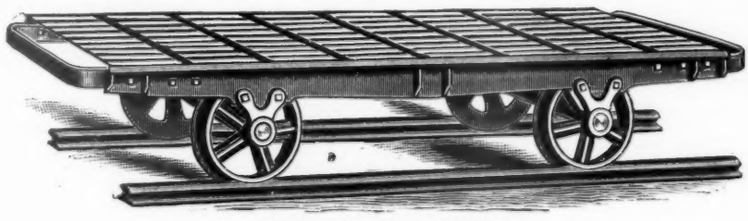

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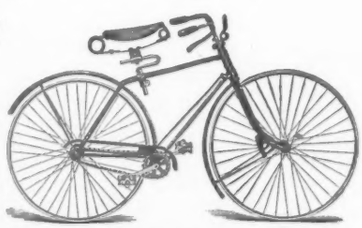

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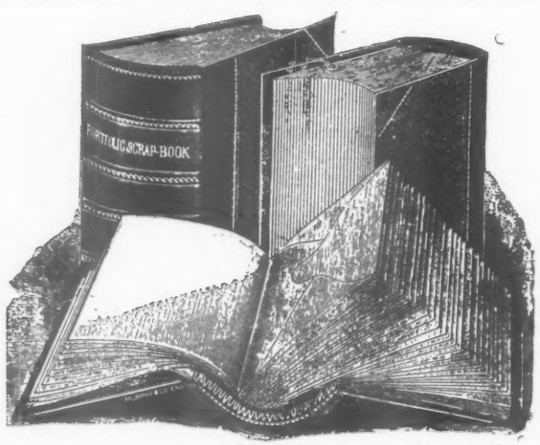

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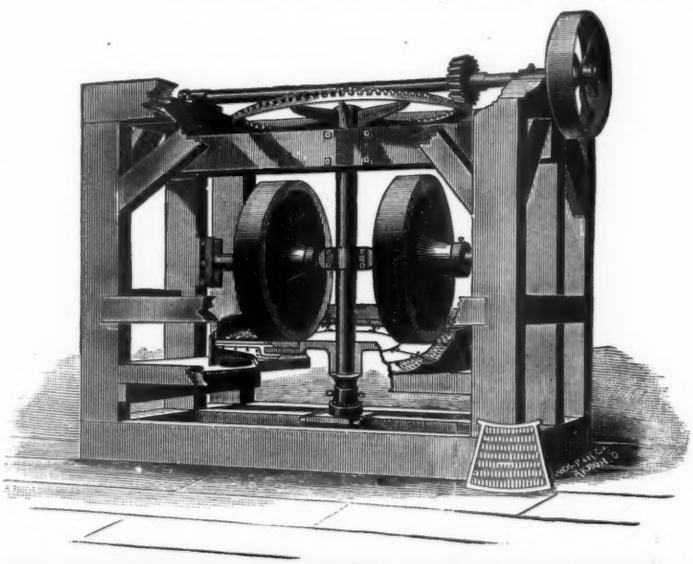

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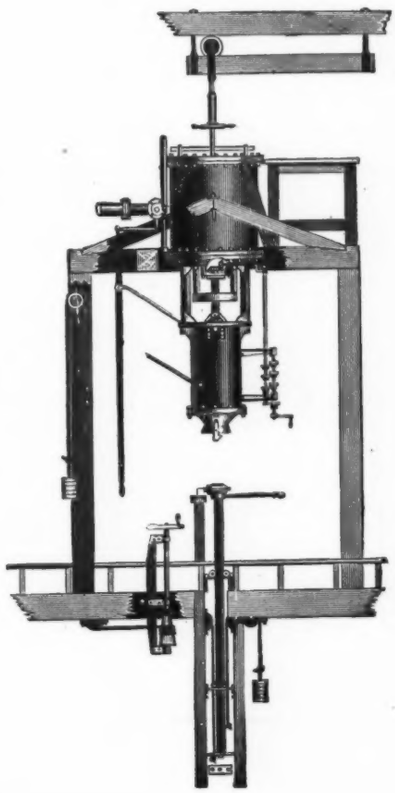

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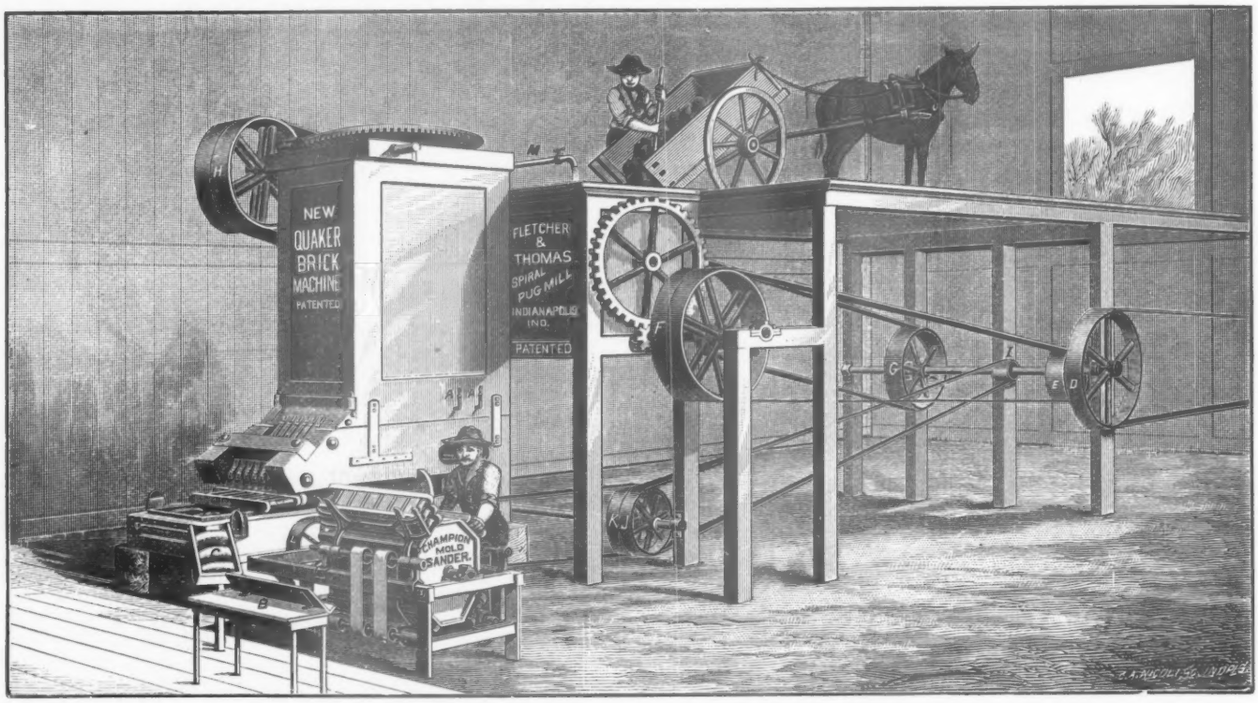

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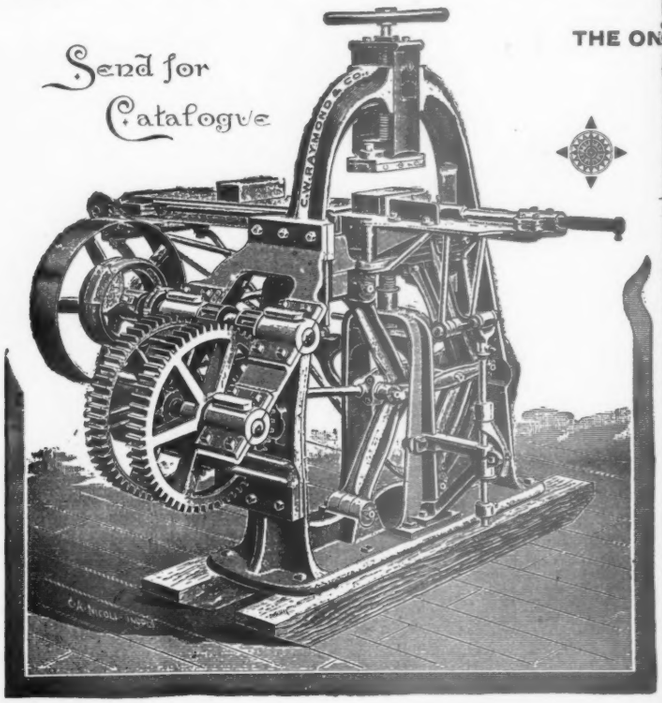

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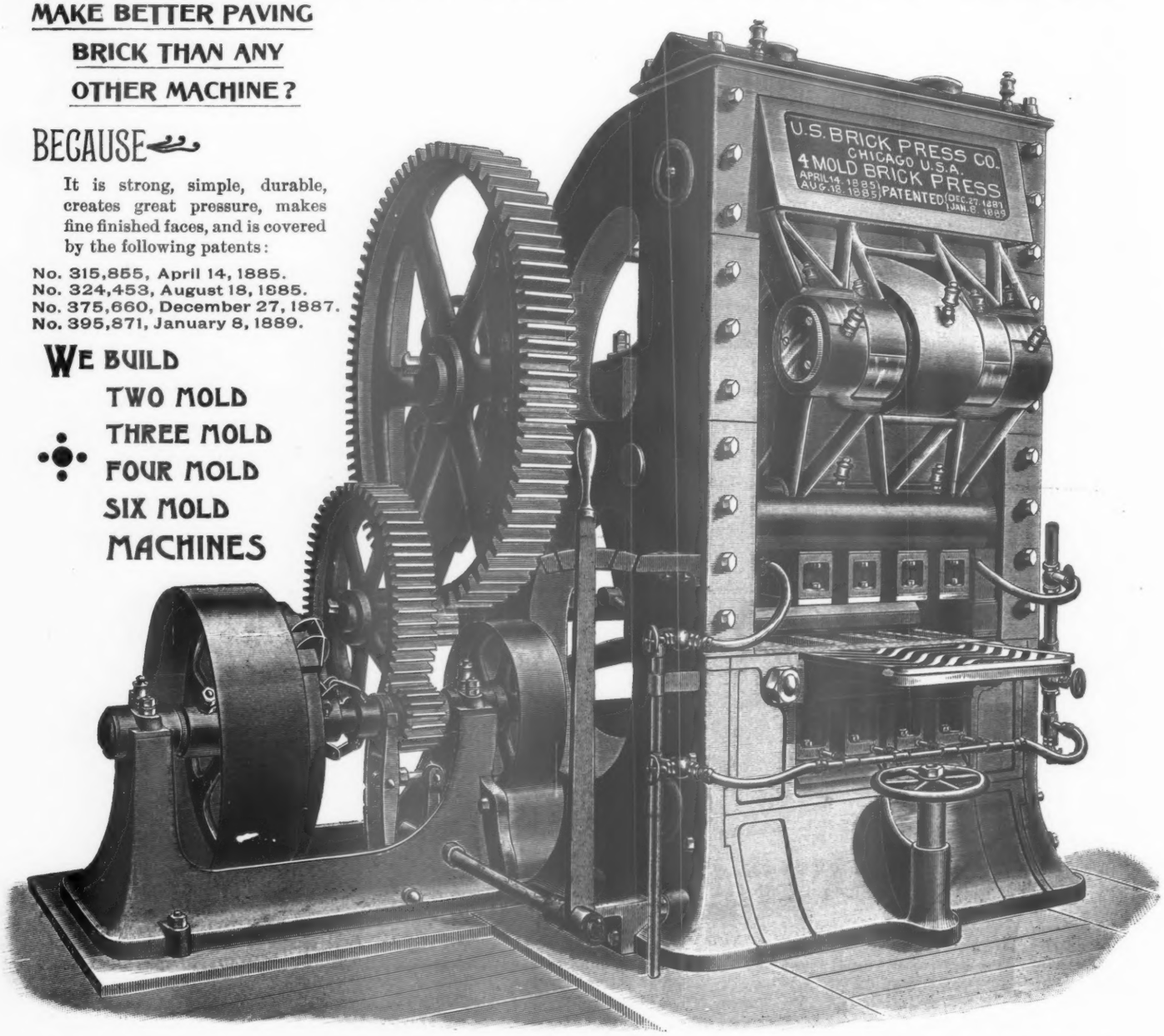

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While Paris, London and Berlin are putting down miles of wood pavement yearly, having proven it the best and most economical, though costing much more there than here, some cities in our own country profiting by their experience are doing the same, as ten miles of our *sapless cylindrical paving blocks* will be laid in Michigan and Indiana during the season of 1891, making an ideal roadway at a low cost. Our second quality blocks make the cheapest crosswalks and warehouse floors and paving for private alleys. Cities desiring the best paving material—dollar for dollar—in the world, should not fail to investigate the merits of our product.

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FOR THE STATE OF ALABAMA, AND FOR MAKING AND LAYING

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Contractors for Paving Streets and Sidewalks with the best and cheapest Pavement known.

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Interstitial Filling for any kind of Block Paving,
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It has been in Use in Columbus, Ohio, for Six Years,

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OF ALL KINDS

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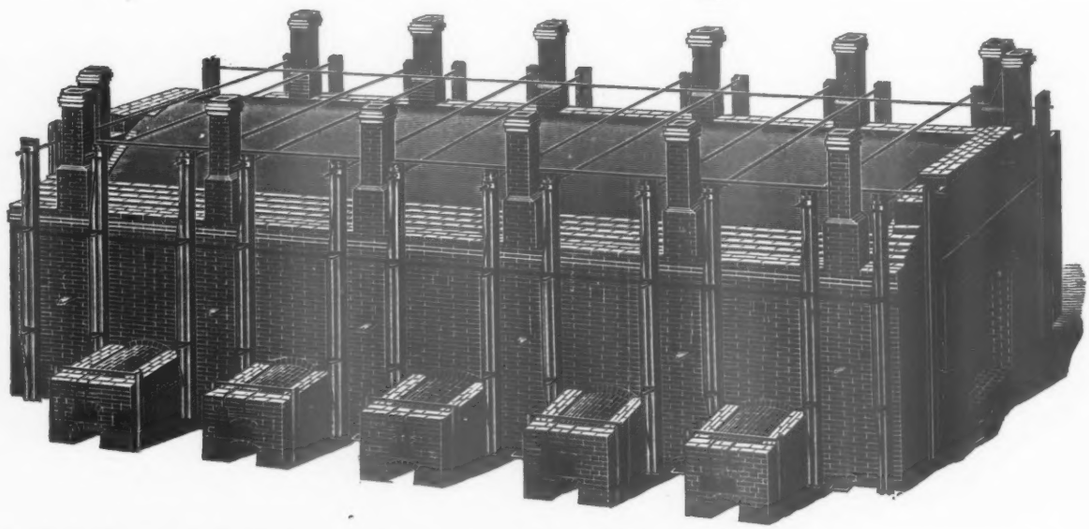
The Eudaly Kiln



Is No Longer an Experiment. Burns All Hard

This kiln is used by a majority of the largest STREET PAVING BRICK PLANTS in the country. It has no superior for FINE PRESSED OR FRONT BRICK. For further particulars

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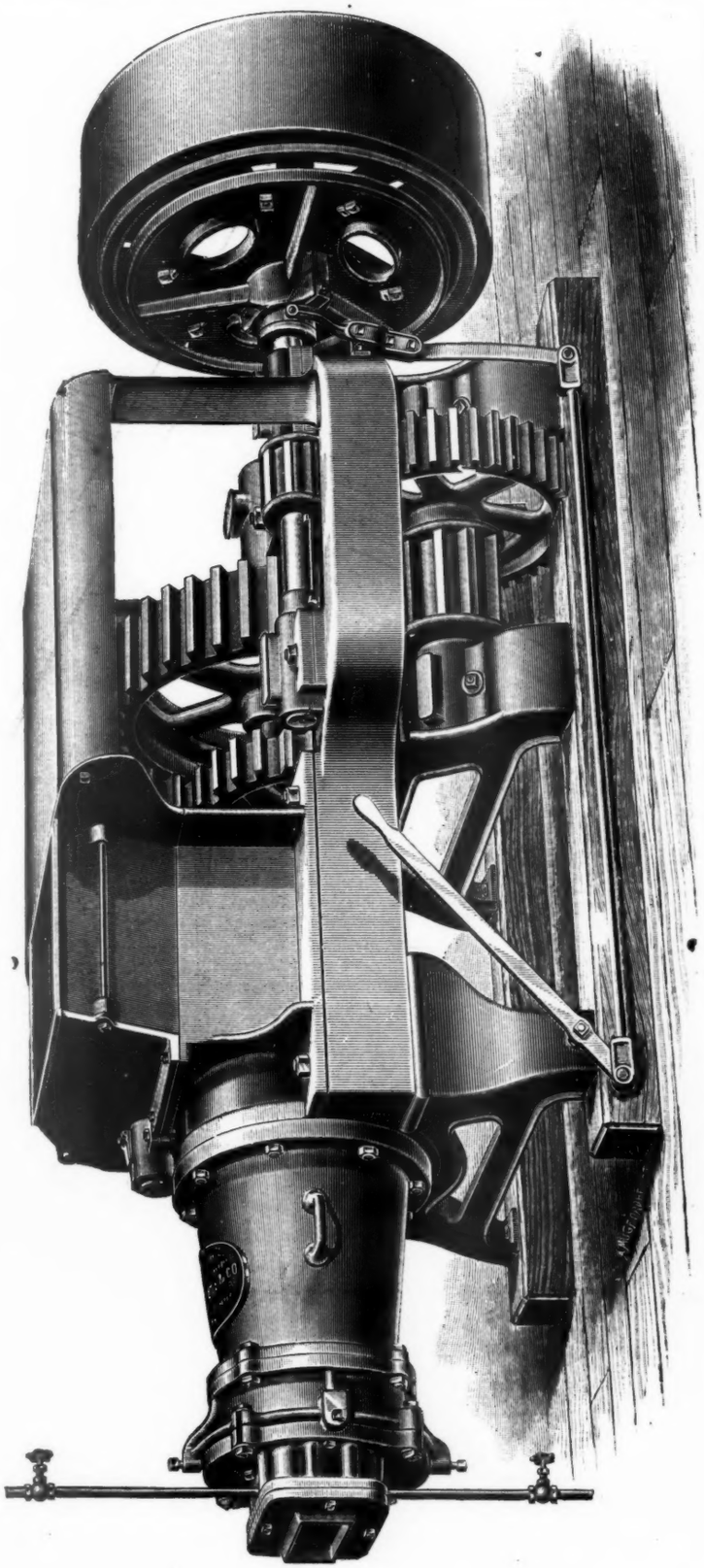

THIS MACHINE IS WELL MADE

AND IS SUBSTANTIAL AND SERVICEABLE.

IT HAS special advantages not found in others, and will produce brick of the best quality at the lowest cost.

PARTICULARLY WELL ADAPTED TO THE MANUFACTURE OF STREET PAVING BRICK OF THE GREATEST DENSITY.

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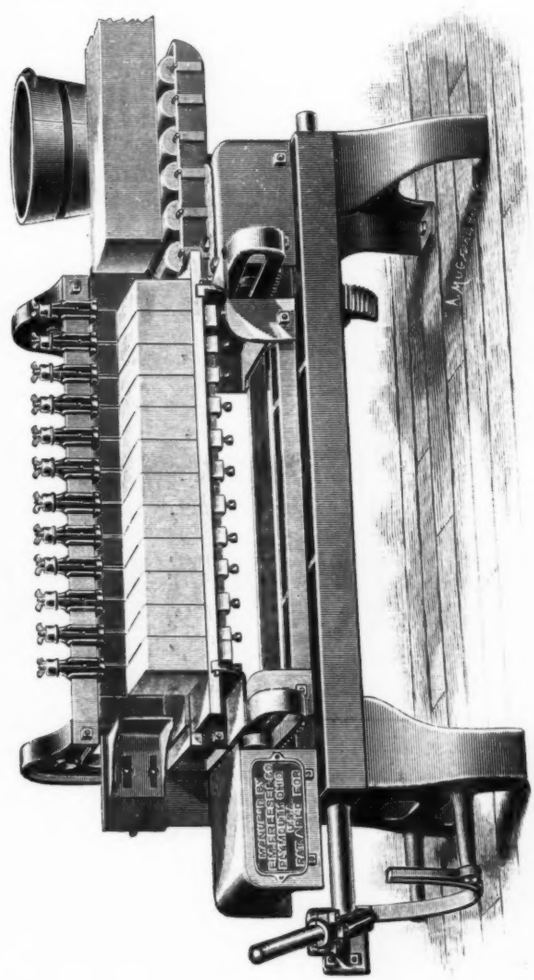

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NUMBER	SENT BY	REC'D BY	CHECK
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RECEIVED at Willoughby, O. 2d Am Dec 22 1891

Dated Jamesville, O. 22

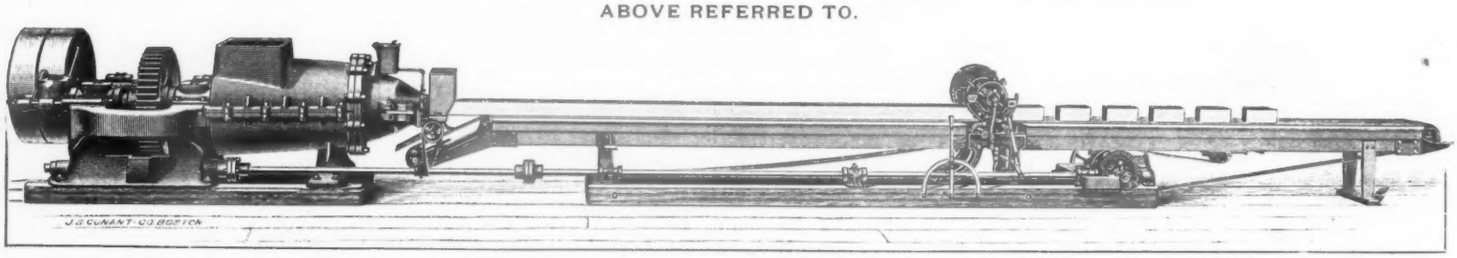
To J W Penfield & Son

Ship immediately if possible the auger machine. The one we started last month is doing nobly. No laminations in brick. No breaks in machinery. Wire tracer after machine as soon as you ship.

J B Townsend Brick & Contracting Co.

THIS IS THE MACHINE

ABOVE REFERRED TO.



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